ALTERNATIVES

Testimony of Jeanine Hinde[1]

INTRODUCTION

This analysis evaluates a reasonable range of potentially feasible alternatives to the proposed Hidden Hills Solar Electric Generating System (HHSEGS) project. Staff reviewed the alternatives analysis provided by the project applicant in the application for certification (AFC) for the HHSEGS project, using that as a starting point for the alternatives analysis in this staff assessment.

Staff reviewed many potentially feasible off-site alternatives and alternative renewable technologies during the initial work to determine the scope and content of this analysis, including those that were also reviewed in the AFC for the proposed project. That review led to selection by staff of the following six project alternatives for full analysis and comparison to the proposed HHSEGS project:

- No-Project Alternative
- Sandy Valley Off-site Alternative (same technology as the proposed project)
- Solar Power Tower with Energy Storage Alternative (at the proposed HHSEGS site)
- Solar Photovoltaic Alternative (at the proposed HHSEGS site)
- Parabolic Trough Alternative (at the proposed HHSEGS site)
- Reduced Acreage Alternative

Staff concludes that the primary environmental benefits of the Solar Photovoltaic (PV) Alternative compared to the proposed project are greatly reduced impacts on Visual Resources, Biological Resources, and Cultural Resources. The Solar PV Alternative reduces the magnitude of potential impacts on Water Supply. The Solar PV Alternative would eliminate the potential for mortality and morbidity of avian species from exposure to concentrated solar flux over the solar collector arrays. Because the Solar PV Alternative would not involve installation of solar power towers or other extremely tall structures, the potential for avian species to collide with the types of equipment and permanent facilities that would be part of the proposed project would be reduced under the Solar PV Alternative. If substantially reducing the extent and severity of direct environmental effects is the priority, then the Solar PV Alternative would be environmentally superior to the proposed project. An analysis of the environmentally superior alternative comparing the effects of each of the project alternatives to the proposed HHSEGS project is at the end of this alternatives analysis.

Preparation of this alternatives analysis included reviews of many other renewable energy technologies that are at various stages of development, research, and implementation in California. Discussions of other renewable energy technologies that

[1] **Alternatives Appendix-1** lists other staff contributors to this analysis of project alternatives.

are not considered potentially feasible alternatives to the proposed project are presented in **Alternatives Appendix-2** of this staff assessment, **Other Renewable Energy Technologies**.

CEQA REQUIREMENTS

As lead agency for the proposed Hidden Hills Solar Electric Generating System project (HHSEGS or proposed project), the California Energy Commission (Energy Commission) is required to consider and discuss alternatives to the proposed project. The guiding principles for the selection of alternatives for analysis in an environmental impact report (EIR) are provided by the California Environmental Quality Act Guidelines (State CEQA Guidelines) (Cal. Code Regs., tit. 14, § 15000 et seq.). Section 15126.6 of the State CEQA Guidelines indicates that the alternatives analysis must:

- describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project;
- consider alternatives that would avoid or substantially lessen any significant environmental impacts of the proposed project, including alternatives that would be more costly or would otherwise impede the project's objectives; and
- evaluate the comparative merits of the alternatives.

These regulations also apply to the document used as a substitute for an EIR in a certified program (Cal. Code Regs., tit. 14, §§ 15251 and 15252).

The lead agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives (Cal. Code Regs., tit. 14, § 15126.6[a]). CEQA does not require an EIR to "consider every conceivable alternative to a project. Rather it must consider a reasonable range of potentially feasible alternatives…." The range of reasonable alternatives must be selected and discussed in a manner that fosters meaningful public participation and informed decision making (Cal. Code Regs., tit. 14, § 15126.6[f]). That is, the range of alternatives presented in this analysis is limited to ones that will inform a reasoned choice by Energy Commission decision makers. Under the "rule of reason," an EIR "need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative" (Cal. Code Regs., tit. 14, § 15126.6[f][3]).

The lead agency is also required to (1) evaluate a "no-project alternative," (2) identify alternatives that were initially considered but then rejected from further evaluation, and (3) identify the "environmentally superior alternative" among the other alternatives (Cal. Code Regs., tit. 14, § 15126.6).

Alternatives may be eliminated from detailed consideration by the lead agency if they fail to meet most of the basic project objectives, are infeasible, or could not avoid any significant environmental effects (Cal. Code Regs., tit. 14, § 15126.6[c]).

ALTERNATIVES SCREENING

The ideal process to select alternatives to include in the alternatives analysis begins with the establishment of project objectives. Section 15124 of the State CEQA Guidelines addresses the requirement for a statement of objectives (Cal. Code Regs., tit. 14, § 15124[b]):

> *A clearly written statement of objectives will help the lead agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision makers in preparing findings or a statement of overriding considerations, if necessary. The statement of objectives should include the underlying purpose of the project.*

A goal of state policy is to implement California's Renewables Portfolio Standard (RPS) program, which was established in 2002 under Senate Bill (SB) 1078, accelerated in 2006 under SB 107, and expanded in 2011 under SB X 1-2. Other related legislation has altered specific parts of the RPS program. The RPS program requires a retail seller of electricity to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020. The California Public Utilities Commission (CPUC) and the Energy Commission are jointly responsible for implementing the program.

The importance of achieving these renewable energy goals was emphasized with the enactment of Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, which sets aggressive greenhouse gas reduction goals for the state.

The Renewable Energy Resources Program (SB 107) states that the Energy Commission's program objective is "to increase, in the near term, the quantity of California's electricity generated by in-state renewable electrical generation facilities, while protecting system reliability, fostering resource diversity, and obtaining the greatest environmental benefits for California residents" (Pub. Resources Code, § 25740.5[c]).

Staff has identified the project objectives, as follows:

- Safely and economically construct and operate a nominal 500-megawatt renewable electrical generation facility resulting in sales of competitively priced renewable energy consistent with the needs of California utility companies.
- Develop a renewable energy facility that will supply electricity for use by retail sellers and publicly owned electric utilities to help satisfy their required California Renewables Portfolio Standard (RPS) program goals.
- Develop a renewable energy facility capable of providing grid support by offering power generation that is flexible.
- Ensure construction and operation of a renewable electrical generation facility that will meet permitting requirements and comply with applicable laws, ordinances, regulations, and standards (LORS).

- Develop a renewable energy facility in a timely manner that will avoid or minimize significant environmental impacts to the greatest extent feasible.
- Obtain site control and use within a reasonable time frame.
- Develop a renewable energy facility in an area with high solar value and minimal slope.

These project objectives are generally based on the project objectives set forth by the project applicant; however, they have been altered by staff to facilitate this analysis of a reasonable range of potentially feasible alternatives, in accordance with requirements of the State CEQA Guidelines for an alternatives analysis. The project applicant's project objectives are listed in the "Executive Summary" of the AFC for the HHSEGS project (Hidden Hills Solar I and II, LLCs 2011a).

ALTERNATIVES CONSIDERED IN THE APPLICATION FOR CERTIFICATION

Review of Off-site Alternatives

Section 6.0, "Alternatives," of the AFC evaluated eight off-site alternatives and the No-Project Alternative (Hidden Hills Solar I and II, LLCs 2011a).

Subsection 6.2 of the AFC discusses alternative sites that were part of the screening analysis for off-site alternatives to the HHSEGS project site. Alternative sites that were considered include the following (see **Alternatives Figure 1**):

- Centennial Flat
- Panamint Valley
- Chicago Valley
- Tecopa
- Sandy Valley
- Death Valley Junction
- Calvada South
- Trona

Of these eight off-site alternatives, the project applicant carried forward the Calvada South and Trona sites for further analysis (Hidden Hills Solar I and II, LLCs 2011a). The remaining six were not retained by the project applicant for further analysis based on a limited review of the sites' characteristics compared to the applicant's screening criteria. Subsection 6.2.1.1, "Alternative Sites That Are Not Feasible," of the AFC briefly discusses the reasons for eliminating the six alternatives. Some of the stated reasons are excessively long linears (i.e., long transmission lines and natural gas pipelines), biological sensitivity (e.g., in known ranges of desert tortoise [*Gopherus agassizii*] or Mohave ground squirrel [*Spermophilus mohavensis*]), possible shortfalls of contiguous

private land acreage, location relative to the China Lake Naval Air Weapons Station (NAWS), and high visual sensitivity. Water supply for the six rejected alternatives is described either as "uncertain," "medium," or "poor." Subsection 6.2.1.3, "Alternative Sites Would Fail to Satisfy Some of the Project Objectives," states that the Panamint Valley, Tecopa, Chicago Valley, and Death Valley Junction alternative sites have constrained transmission capacity requiring system upgrades "that would make it more difficult, if not impossible, for those areas to be available by 2015." Chicago Valley is identified as the only location that has sufficient contiguous private land to meet the development schedule. Tecopa and Sandy Valley are identified as being too small to allow for the project as proposed.

Based partially on information provided in the AFC, Energy Commission staff (staff) concurs with the project applicant's rejection of the Centennial Flat, Panamint Valley, Chicago Valley, Tecopa, and Death Valley Junction alternative sites. Staff reviewed the screening level information provided by the project applicant on the Sandy Valley site and determined that more information was needed to adequately evaluate the site. **Alternatives Table 1** summarizes information from the AFC on the Sandy Valley off-site alternative.

Alternatives Table 1
Information from the Application for Certification on the Sandy Valley Off-site Alternative

Criteria	Sandy Valley Off-site Alternative
Area and slope	Uncertain whether contiguous land of adequate size is available. No information on slope is provided.
Ability to obtain site control	Sufficient private land may be available, but many parcels are in agricultural use.
General plan and zoning	No information provided.
Transmission lines	Approximately 50 miles of new transmission line required.
Natural gas pipeline	The Kern River Gas Transmission pipeline is about 25 miles away.
Water supply	Individual wells supply water.
Desert tortoise	The site is among the alternatives with the highest ratings for tortoise habitat suitability; however, much of the land has already been disturbed by agricultural use.[1]
Visual quality	No information provided.
Economic viability	"Medium" because the linears are long, but not as long as for other alternative sites.

Alternatives Table 1 Information from the Application for Certification on the Sandy Valley Off-site Alternative	
Criteria	**Sandy Valley Off-site Alternative**

Source: Hidden Hills Solar I and II, LLCs 2011
Notes:
[1] The U.S. Geological Survey habitat rating is 0.6, and the site is adjacent to areas with ratings of 0.5 and 0.6. These are mid-range index values on a scale that ranges from 0.0 (lowest value) to 1.0 (highest value) (Nussear et al. 2009).

In data requests submitted to the applicant in November 2011 and January 2012, staff requested additional information on the Sandy Valley site. Responses to those data requests were received in February 2012. Staff's analysis of the Sandy Valley off-site alternative incorporates information from those data responses. (Please refer to the discussion and analysis below under, "Alternatives Evaluated in Detail.")

Subsections 6.2.2 and 6.2.3 of the AFC provide discussions of the Calvada South and Trona sites and compare the potential environmental impacts of those alternatives to the HHSEGS project (Hidden Hills Solar I and II, LLCs 2011a). The Calvada South and Trona sites have been carefully evaluated by staff and eliminated from detailed consideration in this staff assessment because neither of them could have avoided or lessened the environmental impacts of the proposed project, and in some cases, could have resulted in much greater impacts compared to the proposed project. Staff reviewed the information in the AFC and used other maps and resource data to characterize the two sites.

The project applicant identifies greater impacts on biological resources at the Calvada South and Trona sites compared to the proposed project. Greater impacts on visual resources are identified at the Trona site because of the Trona Pinnacles, an unusual geological feature in the Searles Dry Lake basin. However, staff observes that the Trona Pinnacles are south of Searles Valley and approximately 16 miles south of the Trona site identified in the AFC. At this distance, it is likely that views of the Trona Pinnacles would be unaffected by a project at the Trona site.

Based on a review of regional maps, staff observes that the Trona site is located along Trona-Wildrose Road, which is a county highway that connects with a segment of State Route (SR) 178 near Ridgecrest and turns north near the turnoff to the Trona Pinnacles before continuing through remote areas, including the Panamint Valley. The highway continues north and meets SR 190 east of Panamint Springs within Death Valley National Park (see **Alternatives Figure 1**). Given the location of the Trona site along a remote highway providing access to Death Valley National Park and other scenic areas, it is presumed that the visual impacts from a project at the Trona site would be high.

The AFC identifies a greater impact on water resources at the Trona site compared to the proposed project, describing water for that alternative as "troublesome" and a water supply that is "very high in salinity and minerals."

Subsection 6.2.2.1 of the AFC, “HHSEGS Project Site,” describes the proposed project site as having “low density populations of desert tortoise and low-quality tortoise habitat.” Pedestrian transect surveys conducted by biologists for the project applicant on April 13 and May 18, 2011, resulted in observations of two live tortoises at the site and 13 additional tortoises within the *zone of influence* transects surrounding the project site (Hidden Hills Solar I and II, LLCs 2011a). Refer to the **Biological Resources** section of this staff assessment for a discussion and analysis of sensitive plant and animal species at the HHSEGS project site, including desert tortoise.

Subsection 6.2.3.2 of the AFC, “Biological Resources,” states that “desert tortoise density surveys performed at HHSEGS and the Calvada South sites indicated a higher density of desert tortoise at Calvada South.” However, no information is provided in the AFC documenting the conclusion on desert tortoise density at the Calvada South site. The United States Geological Survey (USGS) desert tortoise habitat index value for the Calvada South site is 0.9 (Nussear et al. 2001). The discussion in the AFC also states that the Calvada South site has a higher density of native vegetation and less surface disturbance compared to the HHSEGS site. The AFC identifies a “higher biological concern” at the Trona site due to its location in the Mohave Ground Squirrel Conservation Area and potential to impact critical habitat for the Inyo California towhee (*Pipilo crissalis eremophilus*). The USGS desert tortoise habitat index value for the Trona site is 0.8 (Nussear et al. 2009).

Subsection 6.2.2 of the AFC briefly discusses transmission lines for the Calvada South and Trona alternative sites. The Calvada South site is approximately 2 miles southeast of the HHSEGS site, and the new transmission lines for this alternative would be similar in length to those required for the proposed project. According to information in the AFC, approximately 40 miles of new transmission line would be required to connect a project at the Trona site to the Inyokern Substation near U.S. Route 395. The feasibility of interconnecting at the Inyokern Substation is unknown.

An approximately 35-mile-long natural gas pipeline would be constructed to connect the proposed project to the existing interstate natural gas pipeline that is owned and operated by the Kern River Gas Transmission Company (KRGT). A natural gas supply for the Calvada South alternative site would require construction of a slightly longer pipeline to connect to the KRGT pipeline. Subsection 6.2.2.3 of the AFC states that a Pacific Gas & Electric Company (PG&E) natural gas pipeline up to 12 inches in diameter is located approximately 12 miles south of the Trona site. Staff observes that this PG&E pipeline has a 10-inch diameter, which is insufficient to serve the project. Based on data mapped by staff on natural gas pipelines in the project region, staff observes that the closest high-capacity natural gas pipeline is more than 50 miles south of the Trona site.

The Trona site is approximately 15 miles east of the China Lake Naval Air Weapons Station (NAWS). Based on a review of regional maps, staff observes that the Trona site is approximately 20 miles northeast of Armitage Airfield, which is in the southern portion of the China Lake NAWS. The Department of the Navy promotes mutually compatible land uses near the military installation to reduce potential conflicts with the U.S.

Department of Defense (DOD) military mission and protect public health and safety in the region. Although work has not been done to assess potential conflicts of a large renewable energy project at the Trona site with the China Lake NAWS mission, it is presumed that extensive coordination with DOD would be required, and resolution of potential land use conflict issues is unknown.

Staff has not retained the Calvada South site for further analysis based partially on the predicted high habitat values at the site. In addition, the screening level review of the site's characteristics has not resulted in identification of any potential environmental impacts that would be avoided or reduced at the Calvada South site compared to the proposed project.

Staff has identified several issues and potentially severe environmental impacts at the Trona site indicating its probable infeasibility as an alternative to the proposed project:

- *Visual Resources* – probable high visual impacts due to the site's remote character and location relative to Death Valley National Park.
- *Water Supply* – uncertain water supply for the project given that potable water is piped from either Indian Wells Valley (as stated in the AFC) or Ridgecrest (as indicated by staff).
- *Biological Resources* – potential high biological resource values due to its location in the Mohave Ground Squirrel (*Spermophilus mohavensis*) Conservation Area, a high USGS desert tortoise (*Gopherus agassizii*) habitat index value, and the potential to impact critical habitat for the Inyo California towhee (*Pipilo crissalis eremophilus*).
- *Transmission Line Interconnection* – unknown feasibility of interconnecting at the Inyokern Substation near U.S. Route 395.
- *Location Relative to Military Lands* – predicted need for extensive coordination with DOD because of the site's location near the China Lake NAWS.

Review of Alternative Project Configurations

The AFC briefly evaluates changing the proposed project configuration by eliminating the auxiliary natural-gas fired boilers. The analysis states that "elimination of these boilers was considered due to the reduction in air emissions and cost…." The analysis concludes that the boilers "have been included to enhance the operation and economics of the project" (Hidden Hills Solar I and II, LLCs 2011a). The applicant has since conducted boiler optimization studies, and as a result, has removed plans for some of the auxiliary boilers from the proposed project.

The applicant considered developing a smaller plant with a net generating electrical capacity of 100 or 200 megawatts (MWs). The discussion of a project with reduced capacity briefly and generally addresses the proportionately lower impacts on resources such as air quality, biological resources, cultural resources, paleontological resources, soil erosion, waste management, and visual resources. The applicant concludes that a smaller plant "would not feasibly accomplish most of the basic objectives of the project and would not avoid or substantially lessen one or more of the significant effects.

Furthermore, a smaller plant may result in an inefficient use of the land by failing to fully realize the solar potential of the area."

The Reduced Acreage Alternative is analyzed as a potentially feasible alternative in this staff assessment. Refer to the subsection below, "Alternatives Evaluated in Detail," for an analysis of this project alternative.

Review of Alternative Renewable Technologies

Other renewable solar technologies discussed in the AFC include central tower with integral thermal storage, parabolic trough, and solar photovoltaic. These three alternative technologies are analyzed as potentially feasible alternatives in this staff assessment. Refer to the subsection below, "Alternatives Evaluated in Detail," for a full analysis of these alternative technologies.

PUBLIC AND AGENCY PARTICIPATION

Preparation of the HHSEGS alternatives analysis included staff's participation in two publicly-noticed issues resolution workshops in Tecopa, California, and several status conferences that were held before the Energy Commission in Sacramento. Comments from the public and intervenors on the alternatives analysis were considered by staff in determining the scope and content of the analysis. Included here is a summary list of topics pertaining to the alternatives analysis that were presented by commenters and addressed by staff:

- *Request to include an analysis of the bloom box technology (i.e., Bloom's Energy Server™ or solid oxide fuel cells) in the analysis of project alternatives* – A discussion of solid oxide fuel cells is included in **Alternatives Appendix-2**, **Other Renewable Energy Technologies**.
- *Request to include a photovoltaic alternative* – A utility-scale photovoltaic alternative is included in this alternatives analysis. Refer to the section below, "Alternatives Evaluated in Detail," for a full analysis of this alternative.
- *Request to include an analysis of distributed generation* – A discussion and analysis of distributed generation is provided below.

Staff also coordinated with Inyo County staff on the content and scope of the alternatives analysis, including an analysis of the potential land use effects of the off-site alternative that is evaluated by staff. Refer to the section below, "Sandy Valley Off-site Alternative," for a full analysis of this alternative.

Comments submitted on the preliminary staff assessment (PSA) that was published by Energy Commission staff in May 2012 (Energy Commission 2012a) addressed the need for an alternative with a reduced site footprint. In response to those comments, staff has included an additional alternative at the proposed project site that would reduce the total acreage by approximately one-half. See the subsection below, "Reduced Acreage Alternative," for a full analysis of this alternative.

ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

Section 15126.6(c) of the State CEQA Guidelines addresses the requirement to identify any alternatives that were considered by the lead agency but were rejected as infeasible and briefly explain the reasons underlying the lead agency's determination. Staff evaluated the potential for a 500-megawatt (MW) renewable energy facility to be constructed and operated in the Barstow preliminary renewable energy study area (RESA) and determined that it would not reduce or avoid any of the significant impacts of the proposed project. Staff researched and analyzed the potential for the *distributed generation* category of renewable energy production to be a potentially feasible alternative to the proposed project; the analysis and related conclusions are provided below. *Energy efficiency* strategies are critical to reducing energy consumption in the state. A full discussion of energy efficiency is provided below to acknowledge the importance of achieving all cost-effective energy efficiency for the state.

Barstow Preliminary Renewable Energy Study Area

Staff's work to identify potentially feasible alternatives included a review of the October 2011 Draft Preliminary Conservation Strategy (Draft PCS), which is a key part of the Desert Renewable Energy Conservation Plan (DRECP) under development by the Renewable Energy Action Team (REAT) (Energy Commission 2011a). The purpose of the DRECP is to ensure protection and conservation of California desert ecosystems while facilitating the review and approval of appropriate renewable energy development projects.

Development of the Draft PCS included identification of RESAs based on the presence of available renewable energy resources and a lower potential for conflicts with conservation goals. The Draft PCS map synthesizes physical, biological, and land use data and is based on key biological elements identified by REAT agencies.

The first preliminary draft of the RESAs includes an area of approximately 249,400 acres near the city of Barstow. Acreages depicted in the Barstow RESA are summarized in **Alternatives Table 2**.

Alternatives Table 2
Acreages in the Barstow Renewable Energy Study Area by Preliminary Conservation Strategy (PCS) Map Category

PCS Map Categories	Barstow RESA (acres)
Agriculture	5,563
Developed Lands	18,550
Legally and Legislatively Protected Areas[1]	2,046
Lower Biological Value Areas	44,312
Military Lands	3,565
Moderate to High Biological Value Areas	141,968
Off-Highway Vehicle Lands	—

Alternatives Table 2 Acreages in the Barstow Renewable Energy Study Area by Preliminary Conservation Strategy (PCS) Map Category	
PCS Map Categories	**Barstow RESA (acres)**
Other Managed and Designated Areas[2]	33,378
State Vehicle Recreation Area Lands	—
Total	249,382

Source: Energy Commission 2011a

Notes:

[1] These areas include lands that have legal or legislative mandates for natural resource protection and are predominantly federally and state-owned lands.

[2] These areas include public lands with specific designations for the management of biological resources.

In addition to the city of Barstow, smaller communities in the area include Hinkley, Lenwood, Daggett, Yermo, and Newberry Springs. The Barstow-Daggett Airport is a general aviation airport located in Daggett. The airfield includes two runways; aircraft operations averaged 100 per day for the 12-month period ending June 22, 2011 (AirNav 2011). **Alternatives Figure 2** shows the Barstow RESA and the surrounding area.

The Barstow RESA includes the junction of Interstates 15 and 40 (I-15 and I-40) and segments of these highways east of Barstow. SR 58 and SR 247 enter the western part of the Barstow RESA and end at I-15 near Barstow. The Burlington Northern Santa Fe Railway (BNSF Railway) and Union Pacific Railroad (UPRR) provide long-haul freight service across the western two-thirds of the country. BNSF Railway and UPRR each operate double-track railroad lines that cross the Barstow RESA. The railroads parallel I-15 and I-40 in the eastern portion of the study area. AMTRAK's Southwest Chief route provides passenger service on the BNSF Railway from Los Angeles to Chicago. The Southwest Chief passenger trains travel through the Barstow area twice each night.

The Barstow RESA is within the planning area of the West Mojave Plan, which was adopted in 2006 by the U.S. Bureau of Land Management (BLM) as an amendment to the California Desert Conservation Area (CDCA) Plan. The purpose of the West Mojave Plan is twofold: (1) present a comprehensive strategy to conserve and protect the desert tortoise, Mohave ground squirrel, and over 100 other sensitive plants and animals and the natural communities they inhabit; and (2) provide a streamlined program for complying with the requirements of the California and federal Endangered Species Acts (BLM 2006).

The amended CDCA plan established a 1 percent threshold for new ground disturbance in the Habitat Conservation Area covered by the CDCA plan. New *areas of critical environmental concern* (ACEC) were established, including the Mojave fringe-toed lizard ACEC shown on **Alternatives Figure-2**. New ACECs were established for management of desert tortoise conservation and recovery, including the Fremont-Kramer *desert wildlife management area* (DWMA), Superior-Cronese DWMA, and Ord-Rodman DWMA (BLM 2006) (**Alternatives Figure-2**). Other agencies did not adopt the habitat conservation plan proposed in the West Mojave Plan to cover their jurisdictions;

therefore, the adopted plan applies only to public lands (BLM 2012). Part of the Mojave River crosses the Barstow RESA. Most of its flow is underground while its surface channels remain dry most of the time.

East of Barstow Area

The eastern portion of the Barstow RESA east of Barstow includes rural residential uses and a military base. Preparation of the alternatives analysis for the Ivanpah Solar Electric Generating System (ISEGS) project included an analysis of a potential off-site alternative on approximately 4,000 acres of disturbed private land between the Mojave River and I-15 (**Alternatives Figure-2**). The California Department of Fish and Game (DFG) Camp Cady Wildlife Area is located immediately south of the former alternative site. The alternatives analysis for ISEGS concluded that the private land alternative should be eliminated from consideration due to its potential to cause significant impacts on many environmental resources (Energy Commission 2009a).

The Energy Commission's website documenting renewable energy projects that are undergoing review includes a list and maps of projects (Energy Commission 2012b). Projects mapped in the east side of the Barstow RESA include the 1,500-acre Riverbluff PV Solar Farm, which is identified as a point on the REAT 2011 project tracking map at the former site of the ISEGS private land alternative. If the Riverbluff project is constructed as planned, it would have a generating capacity of 230 MWs. A much smaller solar PV project called Solutions for Utilities Phase 1 and 2 is also mapped in the east side of the Barstow RESA. It is listed as a 3-MW project on 22 acres. The smaller sizes of the two PV projects relative to the proposed HHSEGS project indicate that the area may be best suited for renewable energy projects with smaller profiles overall compared to the proposed project.

The railroads that parallel I-15 and I-40 effectively hem in the east side of the Barstow RESA. Based on staff's review of the area using Google Maps images, the railroad crossings are grade crossings. Moving equipment, people, and construction materials to the area would likely be impossible without construction of at least one road bridge over the railroad. Staff observes the considerable challenges that would accompany coordination with BNSF or UPRR. Staff concludes that development of a large-scale renewable energy facility in this area is unlikely to provide a feasible alternative to the proposed project.

Harper Dry Lake Area

Harper Dry Lake is in the western portion of the Barstow RESA. The Abengoa Mojave Solar Project (AMSP) is under construction next to Harper Dry Lake (**Alternatives Figure-2**). The Solar Electric Generating Systems VIII and IX facilities are immediately northwest of the AMSP site. These renewable energy projects are surrounded by lands being managed by BLM for desert tortoise conservation. Other lands in this part of the Barstow RESA are crossed by one of the two major railroads in the region, SR 58, and the Mojave River. Development of additional utility-scale renewable energy facilities in this area is unlikely to provide a feasible alternative to the proposed project.

Distributed Generation

Overview

Governor Jerry Brown's Clean Energy Jobs Plan identifies a goal of installing 20,000 MWs of new renewable capacity by 2020, including 12,000 MWs of localized electricity generation (i.e., distributed generation [DG])[2] (Energy Commission 2011b). These targeted renewable capacity goals support California's RPS program goals.

There is no single accepted definition of renewable DG. The *2011 Integrated Energy Policy Report* published by the Energy Commission provides this definition: "For the purposes of the 12,000 MWs of renewable distributed generation by 2020 goal, distributed generation is defined as: (1) fuels and technologies accepted as renewable for purposes of the Renewables Portfolio Standard; (2) sized up to 20 MWs; and (3) located within the low-voltage distribution grid or supplying power directly to a consumer" (Energy Commission 2012c). As of 2011, a total of approximately 3,000 MWs of renewable DG capacity has been installed; another 6,200 MWs is pending or authorized under existing state programs that support DG.

Distributed solar facilities vary in size from kilowatts to tens of megawatts and do not require transmission to get to the areas where the electricity is used. Renewable DG technologies like small PV can be located in industrial areas on previously disturbed land or on existing residential, industrial, or commercial buildings. Standards, codes, and fees vary widely for DG projects, and land use requirements for identical systems can vary significantly from jurisdiction to jurisdiction. Efforts at the national, state, and local levels are underway to identify and provide solutions to barriers to permitting renewable DG facilities (Energy Commission 2011b).

CPUC oversees two incentive programs for customer-side of the meter DG (also called *on-site generation* or *self generation*) for customers in the territories of PG&E, San Diego Gas & Electric (SDG&E), and Southern California Edison Company (SCE) (CPUC 2012). The customer-side DG programs include several existing, new, and emerging distributed energy sources, including solar electric. The Energy Commission oversees related incentive programs.

The programs supporting on-site solar projects include CPUC's California Solar Initiative, the Energy Commission's New Solar Homes Partnership, and a variety of solar programs offered through publicly owned utilities. The overall goal of these programs is to encourage Californians to install 3,000 MWs of solar energy systems on homes and businesses by 2016 (CPUC 2012). Generation from these facilities may or may not be able to produce excess electricity exported to the distribution or transmission system, but all are connected to the electric grid (Energy Commission 2011b).

[2] The total 20,000 MWs from the Governor's Clean Energy Jobs Plan includes 8,000 MWs of utility-scale renewable capacity from wind, solar, and geothermal projects.

CPUC has implemented policies and programs related to procurement of utility-side DG (also called *wholesale* or *system-side generation*) (CPUC 2012). Under its investor-owned utility (IOU) solar PV programs, CPUC authorized PG&E, SDG&E, and SCE to own and operate PV facilities and to execute solar PV power purchase agreements with independent power producers through a competitive solicitation process. Based on decisions issued by CPUC in 2009 and 2010, these programs will yield up to 1,100 MWs of new solar PV capacity in the next few years. The energy produced under the solar PV programs will contribute to meeting the state's RPS program goals.

CPUC provides incentives for the development of DG through its Self-Generation Incentive Program (SGIP) (CPUC 2012). This program provides financial incentives for installing new, qualifying, self-generation equipment that meets all or a portion of the electric energy needs of a facility. SGIP administrators include PG&E, SCE, Southern California Gas Company, and the California Center for Sustainable Energy. Eligible fuels for eligible SGIP generating technologies include several renewable and non-renewable fuels. In 2009, SB 412 modified SGIP to require identification of distributed energy resources that will contribute to greenhouse gas (GHG) reduction goals. In 2011, SGIP facilities supplied enough electricity to power over 116,000 homes.

CPUC's Renewable Auction Mechanism (RAM) was created for the procurement of renewable DG projects generating from 3 MWs up to 20 MWs of electricity. CPUC adopted RAM in 2010 to encourage development of resources that can use existing transmission and distribution infrastructure and contribute to the state's RPS program in the near term. CPUC initially authorized the large IOUs to procure 1,000 MWs through RAM by holding four competitive auctions over 2 years. Total procurement was expanded in early 2012 to 1,299 MWs. Project eligibility and viability is determined by the IOUs based on the offerer's ability to demonstrate the following:

- *Site Control* – 100 percent site control obtained through direct ownership, lease, or an option to lease or purchase that may be exercised when the RAM contract is awarded.
- *Development Experience* – One member of the development team has completed at least one project of similar technology and capacity or has begun construction of at least one other similar project.
- *Commercialized Technology* – The project is based on a commercialized technology.
- *Interconnection Application* – An interconnection application has been filed.

Other programs in the state are designed to help offset the costs of installing rooftop PV systems on affordable and low-income housing. For example, the Los Angeles Department of Water and Power (LADWP) relaunched its solar incentive program. As part of the program, LADWP staff is investigating options for making solar affordable for lower income households (Energy Commission 2012c).

If existing state programs to support DG, including solar PV, are fully successful, the state could add approximately 6,000 MWs of additional capacity in the next several

years. Additional programs or incentives may be needed to attain the 2020 goal specified in the Governor's Clean Energy Jobs Plan (Energy Commission 2011b).

Decision to Eliminate this Category of Renewable Energy Generation from Detailed Consideration

Comments received during the proceedings for previous siting cases for utility-scale (greater than 20 MWs) renewable energy projects (e.g., ISEGS) have included requests that the review of project alternatives include a distributed generation photovoltaic (DGPV) project. Both *concentrated* and *distributed* types of systems result in production of electricity from renewable sources (i.e., both use solar technologies). However, the characteristics of the DG category of renewable energy generation make it an impracticable alternative in the context of a CEQA alternatives analysis.

As discussed above, CEQA does not require consideration of "every conceivable alternative to a project…" (Cal Code Regs., tit. 14, § 15126.6[a]). CEQA does not require consideration of "an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative" (Cal Code Regs., tit. 14, § 15126.6[f][3]). Staff concludes that a DGPV alternative is unlikely to provide a feasible alternative to the proposed project based on the following discussions and analysis:

- *Lack of Defined Projects with Sites* – Compared to a large project such as HHSEGS that is proposed for construction on a defined site, a *renewable DG alternative* is amorphous and impossible to analyze. Some renewable DG projects are carried out by proponents and agencies at defined sites; however, the existence of renewable DG projects does not mean that a DG alternative as a category of renewable energy generation could be a valid alternative to a larger generation project such as HHSEGS. The feasibility of a renewable DG alternative is extremely speculative. Given that the location and characteristics of such an alternative is unknown, no method is available to verify whether a collection of DGPV projects totaling several hundred MWs of electrical generation has ever been installed as an alternative to the proposed HHSEGS project.
- *No Oversight or Permitting Authority for a DGPV Alternative* –DG projects are generally initiated and installed or constructed under the jurisdiction of local governments by public utilities, private developers or residents and business owners, and others. Potential sites could be distributed across several local municipalities; and widely varying codes, standards, and fees among local governments with jurisdiction over DG projects is one of the challenges identified for developers (Energy Commission 2012c). The general plans and zoning ordinances of local jurisdictions may address environmental screening and review for large-scale renewable projects, but not for DG projects.
- *Voluntary Participation in On-site Generation Programs* – Participation in the state's on-site generation incentive programs (described above) is based on decisions made by individual residents and property and business owners. Participation in the incentive programs is elective; no laws or regulations mandate installation of on-site renewable energy systems; and utilities do not approve or deny DG systems on private property. Although the importance of the state's DG incentive programs

cannot be overstated, it is not possible to treat a conglomeration of DGPV (or other types of DG) projects as a potentially feasible alternative to a utility-scale renewable energy project such as the proposed project.

- *Failure to Meet Critical Project Objectives* – Critical project objectives for HHSEGS include those addressing development of a renewable energy facility that will contribute to meeting the state's RPS program goals. Based on electricity supply and demand forecast reports prepared by Energy Commission staff, as well as expert witness testimony in prior proceedings (e.g., the ISEGS siting case), renewable DG projects alone would not supply enough electricity to meet the state's mandated RPS program goals. Energy generation to meet the RPS program goals needs to come from a mix of renewable sources, and not merely one to the exclusion of others. Various agency publications identify the need to increase renewable generating capacity from DG and utility-scale sources; both are essential to successfully meeting RPS program goals. Therefore, rejection of the proposed HHSEGS project on the grounds that some renewable DG projects will be built would be inconsistent with the state's RPS program objectives. Such a decision would also be inconsistent with the HHSEGS' project goals of helping to meet such objectives.

Energy Efficiency

In 2003, the principal energy agencies in the state jointly created and adopted the *Energy Action Plan* (EAP), which identifies goals and actions to eliminate energy outages and excessive price spikes in electricity and natural gas (Energy Commission and CPUC 2003). The EAP states the importance of having reasonably priced and environmentally sensitive energy resources to support economic growth and attract new investments that will provide jobs and prosperity for California consumers and taxpayers. The EAP envisions a "loading order" of energy resources to guide agency decisions: (1) the agencies will optimize all strategies for increasing conservation and energy efficiency to minimize increases in electricity and natural gas demand, (2) recognizing that new generation is necessary and desirable, the agencies intend to meet the need first by renewable energy resources and distributed generation, and (3) because the preferred resources require both sufficient investment and adequate time to "get to scale," the agencies will support additional clean, fossil-fueled, central station generation (Energy Commission and CPUC 2003). Section 454.5(b) of the California Public Utilities Code addresses requirements for an electrical corporation's proposed procurement plan, including the requirement to "first meet its unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible."

In 2008, an update to the EAP was published that examines the state's ongoing actions in the context of global climate change following passage of AB 32. The updated EAP iterates how the EAP represents a collaborative process that is subject to change and updating over time. The EAP does not supersede or replace the extensive efforts of the Energy Commission's *Integrated Energy Policy Report* (IEPR), which remains the overall guiding document on energy policy. The IEPR addresses a wide range of issues pertaining to the state's electricity, natural gas, and transportation fuel sectors. The EAP

is intended to capture recent changes in the policy landscape and describe activities to accomplish those policies (Energy Commission and CPUC 2008).

In its discussion on energy efficiency, the 2008 EAP update refers to strategies identified in the 2006 *California Climate Action Team Report*, explaining that "nearly one-quarter of the emission reductions identified from existing or known strategies in 2020 would come from some form of energy efficiency investment, either through improved building codes or appliance standards, utility energy efficiency programs, or smart growth strategies" (Energy Commission and CPUC 2008). The 2008 EAP update and the 2011 IEPR discuss the significance of AB 2021, which was enacted in 2006 to further the goal of achieving all cost-effective energy efficiency. AB 2021 requires the Energy Commission, in consultation with CPUC, to develop statewide energy efficiency potential estimates and targets for California's investor-owned and publicly owned utilities. Progress toward meeting the targets is reported in the current biennial IEPR (Energy Commission 2012c). In December 2011, Energy Commission staff published the final report, *Achieving Cost-Effective Energy Efficiency for California 2011–2020*, which summarizes utility progress and recommends improvements for publicly owned utility efficiency efforts (Energy Commission 2012c).

The 2008 EAP update also discusses CPUC's strategic planning process to develop comprehensive, long-term strategies for making energy efficiency a way of life for Californians. CPUC adopted California's first *Long-Term Efficiency Strategic Plan* in 2008, which was developed through a collaborative process with CPUC's regulated utilities—PG&E, SCE, SDG&E, and Southern California Gas Company—and many other key stakeholders. The long-term plan provides a statewide roadmap to maximize achievement of cost-effective energy efficiency in California's electricity and natural gas sectors from 2009 through 2020 and beyond. CPUC's 2011 update to the *Energy Efficiency Strategic Plan* (CPUC 2011) is a comprehensive plan with goals and strategies covering all major economic sectors in the state.

As described in the 2011 IEPR, California's energy efficiency policies, programs, and energy standards for buildings and appliances in the last three decades have contributed to keeping the state's per capita electricity consumption relatively constant while energy use in the rest of the country has increased by approximately 40 percent (Energy Commission 2012c). In addition to achieving all cost-effective energy efficiency, California's energy efficiency policies include reducing energy use in existing buildings and achieving *zero net energy* building standards. Reducing building energy use to zero net energy is accomplished by combining greater energy efficiency and on-site clean energy production.

In its discussion on reducing energy use in existing buildings, the 2011 IEPR states that more than half of the state's 13 million residential units and more than 40 percent of commercial buildings were built before building and appliance efficiency standards were implemented (Energy Commission 2012c). AB 758 directed the Energy Commission to develop, adopt, and implement a comprehensive statewide program to reduce energy consumption in existing buildings and report on that effort in the IEPR. The Energy Commission shares responsibility with CPUC, local governments, and utilities to

coordinate residential and commercial building retrofit programs. Completion of needs assessments and development of action plans is continuing. Other joint efforts are planned and intended to achieve improved compliance with building and appliance standards and ensure that energy efficiency measures and equipment are properly installed and delivering savings.

The Energy Commission, CPUC, and the California Air Resources Board have adopted a goal of achieving zero net energy building standards by 2020 for residential buildings and 2030 for commercial buildings (Energy Commission 2012c). In September 2011, CPUC released its *2010–2012 Zero Net Energy Action Plan* for the commercial building sector. The Energy Commission regularly updates its building efficiency standards to reflect new technologies and strategies consistent with the goal of achieving 20 to 30 percent energy savings in each triennial update. Appliance standards are being updated to include electronics and other devices plugged into electrical outlets.

Decision to Eliminate Energy Efficiency Strategies from Detailed Consideration

The loading order specified in the EAP does not bind the Energy Commission to analyze particular project alternatives, and energy efficiency measures alone would not satisfy the project objectives and are not intended to replace all central station renewable energy facilities in the state. Staff's analysis of a range of potentially feasible alternatives, including the No-Project Alternative (evaluated below), does not reduce or eliminate opportunities for conservation and energy efficiency.

ALTERNATIVES EVALUATED IN DETAIL

CEQA requires consideration of "a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation. An EIR is not required to consider alternatives which are infeasible" (Cal. Code Regs., tit. 14, § 15126.6[a]). Feasible is defined as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors" (Cal. Code Regs., tit. 14, § 15364).

Project alternatives were selected based on their potential to satisfy most of the basic project objectives discussed above under, "Alternatives Screening," and their potential to reduce or avoid the significant impacts identified for the proposed project.

The analysis below evaluates six alternatives to the proposed project:

- No-Project Alternative
- Sandy Valley Off-site Alternative (same technology as the proposed project)
- Solar Power Tower (SPT) with Energy Storage Alternative (at the HHSEGS site)
- Solar Photovoltaic Alternative (at the HHSEGS site)
- Parabolic Trough Alternative (at the HHSEGS site)

- Reduced Acreage Alternative (at the HHSEGS site)

The proposed HHSEGS project would contribute to a net reduction in GHG emissions from power generation. Net GHG emissions for the state's integrated electric system will decline when new renewable power plants are added that: (1) meet eligibility requirements for renewable energy resources in the state; (2) improve the overall efficiency, or GHG emission rate, of the electric system; and (3) serve increasing load (i.e., energy use) or energy capacity needs more efficiently, and with fewer GHG emissions, compared to fossil-fueled generation. Each of the project alternatives would result in a net benefit in reducing GHG emissions. Because solar thermal power plants with energy storage may not require a natural gas supply for project operations, they may displace more fossil fuel use and are more effective at reducing GHG emissions compared to solar thermal power plants without energy storage.

Summary discussions are provided below comparing the environmental effects of the proposed HHSEGS project to the project alternatives and the No-Project Alternative. Environmental impacts that could potentially occur under a project alternative but that would not occur under the proposed project are also discussed. A summary table comparing the potential impacts of the proposed project to the potential impacts of the project alternatives and the No-Project Alternative is provided in **Alternatives Appendix-3**.

The Energy Commission has the exclusive authority to license thermal power plants in the state with a generating capacity of 50 MWs or greater; therefore, state and local land use plans, policies, and regulations that would be applicable to a project alternative discussed below would be covered under the Energy Commission's in lieu permitting authority.

NO-PROJECT ALTERNATIVE

The State CEQA Guidelines require that, among other alternatives, a no-project alternative shall be evaluated in relation to the proposed project. The no-project alternative analysis must "discuss the existing conditions at the time…environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services" (Cal. Code Regs., tit. 14, § 15126.6[e][2]). As required by CEQA, a No-Project Alternative has been included to allow a comparison of the impacts of approving the proposed HHSEGS project with the impacts of not approving the proposed project.

An EIR was prepared in 1974 by the Inyo County Planning Department for a project to subdivide and develop several thousand acres in Pahrump Valley, an area that includes the present site for the proposed HHSEGS project north of the Old Spanish Trail Highway (referred to as Parcel 86 in the 1974 EIR) (Inyo County 1974). The owner-trustee of the land intended to convert the area that was subdivided and approved for development into 20-acre family farms, and evidence remains showing a dirt road grid system at the site. The proposed HHSEGS site includes approximately 170 lots. However, no significant development occurred, no improvements were implemented,

and no development-related or public services infrastructure was brought to the site or area near the site. It has been close to 40 years since the area was approved for development, and no residences or other occupied structures were ever constructed at the proposed HHSEGS site.

Inyo County officials states that the HHSEGS project site has “significant environmental assets that are just beginning to attract some specialty visitors, such as ecotourists and geologists….While the availability of such a large parcel of privately owned land is unique, the Charleston View area has yet to reach an economic takeoff point” (Inyo County 2012a). Although this statement indicates that Inyo County staff is evaluating ideas for future uses of the area that are consistent with existing zoning at the site, no plan is under consideration that “would be reasonably expected to occur in the foreseeable future if the project were not approved” (Cal. Code Regs., tit. 14, § 15126[e][2]). (Refer to the **Land Use** section of this staff assessment for a discussion of general plan designations and zoning districts for the HHSEGS project site.) The Inyo County letter acknowledges the “uncertainty concerning the availability of sufficient water to support major commercial, recreational or residential developments.” Inyo County staff’s ideas for future uses of the site may not be realized for many years, and the extent to which water supply could limit development potential is not presently known.

Staff states in the PSA for the proposed project that “[t]he proposed HHSEGS site is currently undeveloped, vacant private land” (Energy Commission 2012a). In comments on the PSA, the applicant disagrees that the site is undeveloped and states that “[t]he site is partially developed by graded roads, distribution lines, and existing wells” (Hidden Hills Solar I and II, LLCs 2012a). In August 2011, a Phase I Environmental Site Assessment (Phase I ESA) was prepared for the proposed HHSEGS project (Hidden Hills Solar I and II, LLCs 2011b). The Phase I ESA characterizes the site and vicinity and describes the HHSEGS site as “undeveloped, vacant land.” Site improvements are described to include a fenced weather station on the west-central portion of the site and an abandoned orchard on the south-central margin of the site. It is stated that “[n]o other observable improvements were noted on the subject site.” Land to the north, west, south, and east is described as “generally undeveloped” except for the Charleston View rural residential area south of the project site.

The Phase I ESA describes the six historic groundwater supply wells at the site, four of which are along the Old Spanish Trail Highway. An underground electrical line runs from the wood-pole electrical line along the Old Spanish Trail Highway to a groundwater well and pump box panel in the former orchard area. In the site information questionnaire completed by the major site owners and included in the Phase I ESA, all questions pertaining to structures or buildings at the site are answered as “N/A” or “none.” In answering the question on site history, it states that “[t]here was some cattle grazing on the land years ago, and part of the land (the southern part of Section 28) was used to grow melons and peaches.” Energy Commission staff participated in a site visit to the proposed HHSEGS site on October 27, 2011; based on direct observations during the site visit and other evidence, including site descriptions in the Phase I ESA, staff confirms that the HHSEGS site is undeveloped and vacant. As stated above, no

residential development has occurred in the area covered by the 1974 EIR, including the proposed HHSEGS site. In theory, under the No-Project Alternative, the potential exists for minor land use changes to occur at the site (e.g., construction of a few residences). In comments submitted to the Energy Commission on the No-Project Alternative from the Inyo County Counsel's Office, these facts on the 40-year-old subdivision are presented (Inyo County 2012b):

- Fewer than six residential building permits have been issued for the Charleston View area, including the proposed project site, during the past 10 years.
- No plans have been identified to construct any residential units on any of the lots should the proposed project not proceed.
- The site is located in an area with very limited services.
- The site sits within a short commute to areas with large housing stock, including Pahrump and Las Vegas.
- Current economic predictors suggest residential development of the proposed project site is unlikely in the near future.

Moreover, the overdraft status of the groundwater basin may create further barriers to full development of the lots located on the proposed project site (Inyo County 2012b). Based on available information, the No-Project Alternative is characterized by the continuation of existing conditions at the HHSEGS site. No action would be taken. No renewable energy project would be constructed and operated at the HHSEGS site. No other use is reasonably foreseeable; therefore, it is assumed that existing conditions would persist at the site absent the proposed project. The Phase I ESA for the proposed project describes the site as undeveloped, vacant land. The mere existence of subdivided property does not make development of this relatively isolated area reasonably foreseeable.

Continuation of existing conditions under the No-Project Alternative has the potential to affect certain resource areas to varying degrees. The subsections that follow summarize how minor changes in land use from relatively low intensity uses at the existing HHSEGS site could affect environmental resources at and near the site.

Biological Resources

Under the No-Project Alternative, minor land use changes are reasonably foreseeable. Shadscale scrub, Mojave creosote scrub, and desert washes compose on-site habitat, and these communities would remain primarily intact with minimal losses to development expected. Wildlife inhabit the project area, using it for food, shelter, and breeding; because the site is undeveloped, wildlife are able to move through the area without encountering barriers. Although the area has previously been disturbed by road grading work and agricultural use, extant wildlife abundance and diversity indicate the ongoing biological functionality of the site. This has been well documented by the project applicant, and is evidenced by the presence of rare plants and the *state listed as threatened* desert tortoise.

Even the minor land use changes that could potentially occur on the site would reduce available habitat and could introduce edge effects to the environment such as dust and proliferation of weeds. Continued anthropogenic uses (e.g., off-road vehicle use, camping, or other unauthorized recreational uses) would contribute to degradation of the site and could cause injury or even mortality of wildlife species. Any further site degradation would affect plant and wildlife assemblages by reducing their abundance, distribution, and health. These effects would be minor compared to the proposed HHSEGS project. Impacts on special-status plants, waters of the U.S., and waters of the state under the No-Project Alternative would be **much less compared to the proposed project**. Similarly, impacts on desert tortoise and other special-status wildlife would be **much less compared to the proposed project**. No impacts on avian species would occur from collisions with structures or exposure to concentrated solar flux.

The Pahrump Artesian Aquifer underlying the proposed project site has been in overdraft since the last century (Buqo 2004), with groundwater being pumped at a rate higher than the recharge rate of the aquifer. Groundwater levels are expected to continue to decline, causing adverse impacts on groundwater-dependent vegetation, and subsequently, wildlife that inhabit the area or forage on that vegetation. Without the proposed project, impacts on groundwater dependent plants and wildlife species under the No-Project Alternative would be **somewhat less than the proposed HHSEGS project**.

Cultural Resources

Reasonably foreseeable human activities under the No-Project Alternative would include intermittent use of the site for unauthorized recreational uses. Continued drawdown of local subsurface aquifers due to regional overuse of the resource would also occur. Natural erosion and burial of archaeological deposits would continue as would the degradation of built-environment resources. While the natural and human-induced changes would vary from baseline conditions, staff does not interpret the changes to meet the threshold for consideration as effects in the context of planning for the proposed project. The changes represent the anticipated evolution of the baseline for the project area as well as for many parcels in the vicinity. These effects under the No-Project Alternative would be **much less than HHSEGS**.

Soil and Surface Water

Under the No-Project Alternative, intermittent recreational uses could cause potential soil erosion from occasional vehicle use, and the possibility of litter could cause contamination of storm water runoff. The proposed project would include grading of roughly 440 acres during construction and would add 851 acres of impervious area (equal to about 27 percent of the site) and another 189 acres of graded dirt roads. While the proposed project would require implementation of Best Management Practices and conditions of certification to protect soil and water resources, the No-Project Alternative comparison to the proposed project assumes continuation of existing conditions, which also accounts for the possibility of minor land use changes occurring at the site. Although the site would continue to gradually degrade under the No-Project Alternative,

impacts on soil and surface water would be **much less than the proposed HHSEGS project**.

Water Supply

Under the No-Project Alternative, continued anthropogenic uses, including minor development and use of the site for unauthorized recreational uses, could contribute to overdraft in the Pahrump groundwater basin, if groundwater pumping occurred.

Under the No-Project Alternative, groundwater levels would be expected to continue to decline. The aquifer underlying the project has been in overdraft since the last century, and this trend would likely continue (Buqo 2004). Without the proposed project, impacts from potential drawdown of local wells and impacts on groundwater basin balance would be **somewhat less than HHSEGS**.

SANDY VALLEY OFF-SITE ALTERNATIVE

Overview

This alternative would consist of constructing and operating an approximately 500-MW solar power tower (SPT) project at the Sandy Valley alternative site. The project elements and major facility components of this alternative would be similar to those of the proposed project. The Sandy Valley Off-site Alternative borders the state boundary with Nevada approximately 20 miles southeast (as the crow flies) of the proposed HHSEGS project site. The unincorporated town of Sandy Valley, Nevada, borders the state line. According to 2010 U.S. Census data, a total of 2,051 people were living in Sandy Valley. The community included 811 housing units at an average density of 14.5 units per square mile. USGS topographic maps for the area show a sedimentary basin, Mesquite Valley, straddling the border between Nevada and California in the region encompassing the study area for the Sandy Valley Off-site Alternative.

The project applicant responded to staff's data requests for additional information on a potential off-site alternative in the Sandy Valley area (Hidden Hills Solar I and II, LLCs 2012b). The project applicant provided a map showing a potential 3,119-acre alternative site at the southeast corner of Inyo County. Portions of two parcels included in the project applicant's alternative site overlap with lands managed by BLM in the Pahrump Valley Wilderness to the west. To avoid these particular BLM properties, Energy Commission staff changed the boundary for the Sandy Valley study area. **Alternatives Figure 3** shows the study area for the Sandy Valley Off-site Alternative that has been evaluated by staff.

The altered Sandy Valley study area encompasses approximately 3,354 acres in Inyo and San Bernardino counties. A total of approximately 657 acres in the Sandy Valley study area are federally-owned vacant land; based on available land ownership data, two parcels identified as "government land" are likely managed by BLM. The remaining approximately 2,697 acres are in private ownership. Based on parcel data maintained by Inyo and San Bernardino counties, staff estimates that the properties are owned by 24 individual owners.

The lengths of the linear corridors for the transmission line and the natural gas pipeline for the Sandy Valley Off-site Alternative may be shorter than the linear corridors for the proposed project. The project applicant identified a possible alignment for a generation tie (gen-tie) line to the proposed Valley Electric Association 500-kilovolt (kV) transmission line. The natural gas pipeline to connect the proposed HHSEGS project to the Kern River Gas Transmission (KRGT) pipeline would be approximately 35 miles long. The natural gas pipeline to connect to the KRGT pipeline for the Sandy Valley Off-site Alternative would be either 14½ or 15½ miles long depending on the route. **Alternatives Figures 4** and **5** shows possible alignments for the linear corridors. Like the proposed project, the transmission line and natural gas pipeline would be constructed in Nevada.

Potential to Attain Project Objectives

CEQA requires an alternatives analysis to "describe a range of reasonable alternatives to the project…which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project..." (Cal. Code Regs., tit. 14, § 15126.6[a]).

Development of an approximately 500-MW SPT project at the Sandy Valley alternative site could potentially meet the project objectives related to construction and operation of a utility-scale renewable electrical generation facility, which would lead to the sale of renewable energy and contribute to achieving California's renewable energy goals; approval of amendments to the PPAs by CPUC could be required. This alternative could potentially satisfy the project objectives addressing the requirement to comply with applicable LORS and avoid or minimize significant impacts to the greatest extent feasible. This alternative would satisfy the project objective to develop a renewable energy facility in an area with high solar value and minimal slope. See the discussions below under, "Environmental Analysis," for general analyses of the potential environmental effects of this alternative compared to the proposed project.

The project objectives include an objective to develop a renewable energy facility capable of providing grid support by offering power generation that is flexible. In general, a resource's flexible capacity is based on its operational flexibility, which is the resource's ability to respond to dispatch instructions from the California Independent System Operator (CAISO). Flexibility is characterized, in part, by a resource's ability to be dispatched, and ramped up and down to produce or curtail energy production. A resource's degree of flexibility is largely qualitative, and a resource's flexibility at any particular time can vary depending on the status of that resource (e.g., whether it's online or off-line) or other operating parameters (e.g., already at full load, or the operating range of the resource) (CAISO 2012). CAISO is developing detailed policies on flexible capacity procurement to reliably operate the electrical grid as additional variable resources come online to meet the state's 33 percent renewable energy target. The retirement of aging natural gas-fired resources, including the once-through-cooled resources in the next 10 years is contributing to the need for additional flexible capacity (CAISO 2012).

Integrating variable energy resources such as wind and solar “requires increased operational flexibility, notably the ability to provide services to match real-time upward and downward movements and at *ramp rates* faster than what is generally provided today" (Energy Commission 2011b)[3]. Ramping capability balances the less predictable energy production patterns of renewable resources such as wind and solar. For natural gas facilities, the degree of flexibility generally relates to engine design. A simple-cycle natural gas-fired power plant is highly flexible based on its ability to start or stop quickly and ramp up and down rapidly. A combined-cycle natural gas-fired power plant has the ability to create additional energy from steam, thereby increasing its efficiency compared to a simple-cycle gas-fired plant. Although a combined-cycle gas-fired plant can provide more efficient capacity and energy, it generally has longer start-up times; therefore, it is less flexible than a simple-cycle gas-fired plant. Newer designs for simple-cycle gas-fired plants have resulted in increased operating efficiencies, and some newer combined cycle plants have shortened start-up times.

Solar PV and wind power are intermittent resources that have no inherent upward ramp capability; these two fuel sources (sunshine and wind) are ineligible to provide flexible ramping capacity (CAISO 2012). Because these energy sources are variable, solar PV and wind power are incapable of responding to dispatch instructions and needs. Solar PV and wind increase the need for other flexible resources to assist in the integration of these variable resources.

Solar thermal technologies that do not include energy storage (e.g., the proposed project) generally have lower ramping capabilities compared to solar thermal with energy storage and are not specifically considered by CAISO to provide flexible capacity. Solar thermal technologies without integral thermal storage (e.g., the Ivanpah Solar Electric Generating System) rely on natural gas-fired steam boilers to provide thermal input in the morning and during periods of cloud cover. The solar thermal characteristics of the proposed project enhance its ability to maintain some stability and consistency in the MWs of electricity produced during periods of cloud cover. The proposed HHSEGS project has some operational flexibility during daylight hours that slightly increase its value to the electrical grid system compared to a solar PV project. For example, the proposed project could be operated to respond to a request from CAISO to curtail energy production, but conversely, the proposed project could not ramp up unless it was operating at less than full load, and the solar fuel was available (i.e., the sun was shining).

Solar thermal technologies with energy storage can store excess energy when on-line generation exceeds load (Energy Commission 2011b). Adding thermal storage to a concentrating solar power plant can result in generation of dispatchable electricity depending on daily resource constraints.

[3] Balancing electricity generation to load, while maintaining the voltage and frequency within operational tolerances, is achieved through resource commitment and dispatch. Fitting any particular generating unit into that process, whether conventional or renewable, is called integration. Integration is generally invisible to the consumer and allows generation and load (i.e., use) to be in harmony (Energy Commission 2011b). Ramping capability is typically expressed as MW per minute.

The project objectives also address obtaining site control and use within a reasonable time frame. Defining what is meant by a reasonable amount of time in the context of the time line for the proposed HHSEGS project is debatable. It is possible that the end of a reasonable time period defines the point at which schedule delays could cause the proposed project to become infeasible, but that point is not currently known. Given the number of property owners at the Sandy Valley Off-site Alternative, staff assumes that obtaining site control and use within a reasonable time period would be difficult and achieving this project objective might not be possible.

The Sandy Valley Off-site Alternative could potentially satisfy five of the seven project objectives. Like the proposed project, this alternative would have a limited ability to satisfy the project objective addressing operational flexibility. The objective to obtain site control and use within a reasonable period of time is also relevant to the discussion of potential feasibility of this project alternative (see below), and it is key to the success of the project. It is not known whether this project objective could be attained.

Potential Feasibility Issues

Staff submitted data requests for information on the potential feasibility and viability of constructing and operating a utility-scale renewable energy facility at the Sandy Valley alternative site. The applicant's data responses identify 16 property owners for the smaller site footprint in the Inyo County portion of the Sandy Valley area. In the data responses, the applicant states that "the feasibility of securing site control from this many property owners renders this alternative site infeasible from a transactional, financial, and project development scheduling perspective" (Hidden Hills Solar I and II, LLCs 2012b). In other responses to staff's data requests, the applicant states the following (Hidden Hills Solar I and II, LLCs 2011b):

> *Sandy Valley may have a sufficient amount of private land to accommodate the HHSEGS project, but many of the private parcels located in Sandy Valley are currently being used for agricultural purposes. Even assuming that the agricultural lands might be available for sale, land consolidation and landowner cooperation is expected to be too time consuming and costly to obtain site control within a reasonable time period and certainly not in time for planned commercial operations, targeted for the first/second quarter of 2015 .*

The statement by the applicant regarding the plan to achieve commercial operation of the project by the first or second quarter of 2015 refers to the applicant's project objectives, which are listed in the "Executive Summary" of the application for certification for the HHSEGS project (Hidden Hills Solar I and II, LLCs 2011a).

The issue of land ownership fragmentation is a topic that was generally addressed as part of the Renewable Energy Transmission Initiative (RETI), which is a California stakeholder process involving development of a conceptual plan to expand the state's electric transmission grid (Energy Commission 2009b). Work on the RETI process included identifying, characterizing, and ranking Competitive Renewable Energy Zones (CREZ) in California and neighboring regions. Areas potentially suitable for solar thermal development (referred to as *proxy* solar projects) were represented on RETI

maps as square areas containing 1,280 acres (2 square miles). Some of the extensively parcelized private lands are near existing infrastructure or are disturbed. Although these lands otherwise appear to be suitable for renewable energy development, proxy projects on properties with 20 or more different landowners were removed from the RETI maps or reshaped to conform to the threshold of 20 landowners per 2-square-mile area.

This 20-landowner criterion was chosen by the CREZ Revision Working Group based on the experience of solar and wind project developers. As a practical matter, increased development costs associated with negotiating land lease or purchase agreements with many landowners (e.g., 40 landowners at a theoretical 4-square-mile project site) could cause such projects to become uneconomical (or infeasible). Staff's study area for the Sandy Valley Off-site Alternative includes 3,354 acres; approximately 24 landowners are identified as owning property in the 5.24-square-mile area. This ratio is well under the threshold discussed in the 2009 RETI report. Nevertheless, securing site control at the Sandy Valley site would be challenging. Gaining site control of federally-owned properties could further complicate the work to secure site control.

The applicant responded to staff's data request for information on any private lands potentially for sale in the Sandy Valley area and described a site visit to the Sandy Valley area on February 3, 2011 (Hidden Hills Solar I and II, LLCs 2012b). No signs advertising property for sale were observed during the site visit. Online research conducted by the applicant indicated that, on average, privately owned properties in the Sandy Valley area of the state had not changed ownership for over 10 years. Most had changed ownership no more than once after the original land purchase or construction date, which was generally reported to be the late 1970s to early 1980s. The applicant states that no properties were listed for sale. Of the privately owned properties at the 3,119-acre alternative site delineated by the applicant, one property had been sold since 2008. It is possible that no property owners are considering selling property at the Sandy Valley alternative site; it is also possible that property owners would consider selling to an interested buyer.

In responses to staff's data request on the viability of the Sandy Valley Off-site Alternative, the applicant explains that bilateral negotiations with each landowner would be the only way to secure site control. The applicant describes how the "high number of parcels involved increases the risk that a landowner could choose not to sell, lease or option the parcel to Applicant, and increases the risk that other landowners may 'hold out' from agreeing to terms to obtain a better deal" (Hidden Hills Solar I and II, LLCs 2012b). The potential feasibility of gaining site control cannot be determined without additional research on the potential to secure site control of properties at the alternative site.

A February 2012 article in the Los Angeles Times reported on some of the successes of land brokers who have been purchasing thousands of acres in the Mojave Desert for possible utility-scale solar energy development (Los Angeles Times 2012). Some land brokers work for solar developers to negotiate land purchases from multiple property owners. Strata Equity Group is a real estate investment company that purchased

approximately 11,500 acres in the West Mojave for solar development. The purchase involved 66 land parcels that were owned by 40 landowners. Of the total acreage, approximately 6,000 acres were owned by one landowner. The total land purchase was completed in 4 years (Flodine, pers. comm., 2012). Purchases of properties are sometimes complicated by title exceptions on specific properties (e.g., mineral rights, various easements, road rights). It could take over 2 years to assemble the necessary acreage for a project at the Sandy Valley alternative site (Flodine, pers. comm., 2012). Whether or not site control and use could be obtained within a reasonable period of time would depend substantially on when negotiations were started relative to the overall project schedule.

The feasibility of obtaining site control and use at the Sandy Valley Off-site Alternative is not clear; however, gaining site control and use is essential to the success of the project. Given the greater number of property owners at the alternative site, it is assumed that gaining site control would delay the project schedule. It is not known at what point a project schedule delay would affect the feasibility of the project altogether.

Environmental Analysis

Alternatives Table 3 presents a summary comparison of impacts of the proposed HHSEGS project to the same or similar potential impacts of the Sandy Valley Off-site Alternative. The comparison of impacts to the proposed project is conveyed using these terms in a graded scale:

- Much less than HHSEGS
- Less than HHSEGS
- Somewhat less than HHSEGS
- Similar to HHSEGS
- Same as HHSEGS
- Somewhat greater than HHSEGS
- Greater than HHSEGS
- Much greater than HHSEGS

Impact conclusions for the proposed project and the comparative impacts for the alternatives are shown using these abbreviations:

— = no impact

B = beneficial impact

LS = less-than-significant impact, no mitigation required

SM or PSM = significant or potentially significant impact that can be mitigated to less than significant

SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

Comparative discussions for each environmental topic area follow the table. As stated above, **Alternatives Appendix-3** contains a complete summary table comparing the potential impacts of the proposed project to the potential impacts of the project alternatives and the No-Project Alternative.

Alternatives Table 3
Summary Comparison of the Proposed Project's Impacts to the Sandy Valley Off-site Alternative

Environmental Effect	Proposed Project	Sandy Valley Off-site Alternative
Air Quality		
Construction-related emissions	SM	Similar to HHSEGS (SM)
Project operations emissions	SM	Similar to HHSEGS (SM)
Biological Resources		
Impacts on special-status plant species	SM	Much less than HHSEGS (SM)
Impacts on waters of the U.S. and waters of the state	SM	Much less than HHSEGS (SM)
Impacts on desert tortoise	SM	Much less than HHSEGS (SM)
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	SM	Much less than HHSEGS (SM)
Impacts on avian species from collisions with project features (see biological resources note)	PSU	Similar to or somewhat greater than HHSEGS (PSU)
Impacts on avian species from exposure to concentrated solar flux	PSU	Similar to or somewhat greater than HHSEGS (PSU)
Potential impacts on groundwater dependent ecosystems	PSM	Somewhat less than HHSEGS (PSM)
Biological resources note: Collisions could be secondary to exposure to concentrated solar flux.		
Cultural Resources		
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see cultural resources note)	LS	Somewhat greater than HHSEGS (PSM)
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	SU	Similar to HHSEGS (PSU)

Alternatives Table 3 Summary Comparison of the Proposed Project's Impacts to the Sandy Valley Off-site Alternative		
Environmental Effect	**Proposed Project**	**Sandy Valley Off-site Alternative**
Potential impacts on significant built-environment cultural resources *on* the site	SM	Similar to HHSEGS (PSM)
Potential impacts on significant built-environment cultural resources *beyond* the site	SU	Similar to HHSEGS (PSU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	SU	Similar to HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	SU	Similar to HHSEGS (SU)
Cultural resources note: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site.		
Fire Protection		
Potential impacts on local fire protection resources	PSM	Similar to HHSEGS (PSM)
Potential impacts on emergency response services	PSM	Similar to HHSEGS (PSM)
Geology and Paleontology		
Potential impacts from strong seismic shaking	SM	Similar to HHSEGS (PSM)
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	SM	Similar to HHSEGS (PSM)
Potential impacts on paleontological resources	SM	Similar to HHSEGS (PSM)
Potential impacts on geological or mineralogical resources	LS	Similar to HHSEGS (LS)
Hazardous Materials		
Potential for release of hazardous materials to occur on-site	SM	Similar to HHSEGS (PSM)
Potential for release of hazardous materials to occur off-site	SM	Similar to HHSEGS (PSM)
Land Use		
Conflicts or inconsistencies with general plan land use designations and zoning	SU	Similar to HHSEGS (SU)
Conversion of agricultural land	—	Much greater than HHSEGS (SM)
Noise and Vibration		
Potential for noise to impact noise-sensitive receptors	PSM	Somewhat greater than HHSEGS (PSM)

Alternatives Table 3 Summary Comparison of the Proposed Project's Impacts to the Sandy Valley Off-site Alternative		
Environmental Effect	**Proposed Project**	**Sandy Valley Off-site Alternative**
Public Health		
Potential for project construction to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Potential for project operations to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Socioeconomic Resources		
Construction employment and increased taxes and fees	B	Similar to HHSEGS (B)
Displacement of existing rural residences	—	Greater than HHSEGS (LS)
Potential impacts on emergency medical and law enforcement services	PSM	Similar to HHSEGS (PSM)
Traffic and Transportation		
Potential impacts on roadway infrastructure	SM	Similar to HHSEGS (SM)
Potential for glint and glare to cause safety hazards or a distinct visual distraction effect from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	PSM	Similar to HHSEGS (PSM)
Potential for construction equipment and/or permanent structures to exceed 200 feet in height above ground level	SM	Similar to HHSEGS (SM)
Transmission Line Safety and Nuisance		
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	SM	Similar to HHSEGS (SM)
Visual Resources		
Construction-Related Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Similar to HHSEGS (SU)
Project Operations Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Similar to HHSEGS (SU)
Waste Management		

Alternatives Table 3 Summary Comparison of the Proposed Project's Impacts to the Sandy Valley Off-site Alternative		
Environmental Effect	**Proposed Project**	**Sandy Valley Off-site Alternative**
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	SM	Similar to HHSEGS (PSM)
Potential for impacts on human health and the environment related to past or present soil or water contamination	PSM	Somewhat greater than HHSEGS (PSM)
Soil and Surface Water		
Soil erosion by wind and water during project construction	SM	Similar to HHSEGS (SM)
Soil erosion by wind and water during project operations	PSM	Similar to HHSEGS (PSM)
Water quality impacts from contaminated storm water runoff	SM	Same as HHSEGS (SM)
Water quality impacts from storm damage	PSM	Similar to HHSEGS (PSM)
Water quality impacts from power plant operations	SM	Same as HHSEGS (SM)
Water quality impacts from sanitary waste	SM	Same as HHSEGS (SM)
Potential impacts from on-site and off-site flooding	SM	Similar to HHSEGS (SM)
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency Management Agency maps	LS	Similar to HHSEGS (LS)
Water Supply		
Potential impacts on local wells	PSM	Similar to HHSEGS (PSM)
Potential impacts on groundwater basin balance	PSM	Similar to HHSEGS (PSM)

Air Quality

Environmental Setting

The study area for the Sandy Valley Off-site Alternative is located in two of the state's air pollution control districts (APCDs). The jurisdictional boundary for the two APCDs in the Sandy Valley study area coincides with the boundary between Inyo and San Bernardino counties. Like the proposed project, the northern half of the study area for this alternative is in the Great Basin Unified Air Pollution Control District (GBUAPCD), which covers the state's Great Basin Valleys Air Basin. The southeastern portion of this air basin exceeds the state 1-hour ozone standard and the state 24-hour particulate

matter standard for particles with a size of less than 10 microns in diameter (PM10). The air basin is in attainment or unclassifiable for all of the federal standards and the state standards for carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter with a particle size less than 2.5 microns (PM2.5). Refer to the **Air Quality** section of this staff assessment for additional information on the Great Basin Valleys Air Basin and the GBUAPCD.

The southern half of the study area for this alternative is in the Mojave Desert Air Quality Management District (MDAQMD). The Mojave Desert Air Basin covers an area that includes the MDAQMD. The portion of the study area for the Sandy Valley Off-site Alternative that is in the Mojave Desert Air Basin is designated unclassified for the federal 8-hour ozone ambient air quality standard and for the federal PM10 ambient air quality standard. The area is in attainment or unclassified for all other federal standards and averaging times. The portion of the alternative site that is in the Mojave Desert Air Basin has been designated moderate nonattainment for the state ozone ambient air quality standard and is also designated nonattainment for the state PM10 ambient air quality standard. The area is in attainment or unclassified for all other state standards. Local rules of the MDAQMD would apply to a project located in its jurisdiction. An entirely new Determination of Compliance from MDAQMD would also be required.

Environmental Impacts Pertaining to Both Air Basins

Exhaust emissions from heavy-duty, diesel construction equipment and fugitive particulate matter (dust) emissions would occur during project construction phases for the Sandy Valley Off-site Alternative. Exhaust emissions would also be caused during worker commute trips, hauling of equipment and supplies to the site, and operation of crew trucks (e.g., derrick trucks, bucket trucks, pickups). Workers and trucks hauling equipment and supplies would have to commute approximately 46 miles southwest to the alternative site, which is comparable to the driving distance to the proposed project site from the Las Vegas area. Approximately 50 percent of the workforce from California of the total employed workforce would be lodging in the Las Vegas area. Approximately 15 percent of the workforce would lodge and commute approximately 40 miles southeast to the alternative site from the city of Pahrump area, which is about 15 miles further compared to the distance between the proposed project site and the city of Pahrump. The remaining of those would presumable be lodging and commuting from Tecopa and Shoshone (Inyo County) and the distance would be about the same from the proposed project.

The proposed HHSEGS site is 20 miles northwest of the Sandy Valley Off-site Alternative site (as the crow flies). Under this alternative, appropriate conditions of certification for potential impacts on air quality at the Sandy Valley alternative site would likely involve similar, locally-oriented recommendations such as the conditions of certification presented in the **Air Quality** section of this staff assessment.

The preliminary staff assessment for HHSEGS was prepared with input from the GBUAPCD preliminary determination of compliance (PDOC) document for the proposed HHSEGS project. The HHSEGS project would comply with GBUAPCD rules and regulations.

Construction and operation of the energy facility at the Sandy Valley Off-site Alternative site would likely achieve compliance with GBUAPCD rules and regulations, for the emitting sources located in the area under the jurisdiction of GBUAPCD.

Like the proposed HHSEGS project, this alternative would emit some greenhouse gases (GHGs). However, construction and operation of a renewable energy facility at the Sandy Valley alternative site would contribute to meeting the state's RPS program goals, and it would result in a net cumulative reduction of GHG emissions as new and existing fossil fuel-fired electricity resources would be displaced.

Electricity is produced by operation of interconnected generation resources. Operation of one renewable energy power plant at the proposed project site or the Sandy Valley alternative site would affect all other power plants in the interconnected system. Operation of a renewable energy power plant at the Sandy Valley alternative site would generally affect the overall electricity system and GHG emissions levels.

These system impacts would result in a net reduction in GHG emissions across the electricity system providing energy and capacity to California. Like the proposed project, the Sandy Valley Off-site Alternative would result in a cumulative overall reduction in GHG emissions from power plants. This alternative would not worsen current conditions or make a cumulatively considerable contribution to any significant cumulative impact associated with GHGs.

Conclusion for Air Quality Impacts

Exhaust emissions from heavy-duty, diesel construction equipment and fugitive particulate matter (dust) emissions would be essentially the same for the Sandy Valley Off-site Alternative compared to the proposed HHSEGS project.

Construction and operational emissions at the Sandy Valley alternative site would be **similar to HHSEGS** for emitting sources.

Biological Resources

Biological resources staff toured the Sandy Valley Off-site Alternative study area on January 19, 2012. The California Natural Diversity Database (CNDDB) for the Sandy Valley study area (DFG 2012) was reviewed before the site visit, along with aerial imagery. The dominant land use is agriculture, with a network of irrigation drainages and pivots, and wind rows between crop fields. Agricultural uses have fragmented and degraded native habitat in the area. Goodding's phacelia (*Phacelia pulchella* var. *gooddingii*), a special-status plant, is recorded in the study area. Staff notes that the area has probably not been subject to biological surveys; therefore, negative CNDDB results are inconclusive as to the presence of special-status plants, wildlife, and habitat. Mesquite bosques are mapped south of the Sandy Valley Off-site Alternative site (DFG 2012), and as a phreatophytic vegetation type, could be impacted by declines in groundwater supply. All mesquite-dominant communities are rare in California and Nevada (Crampton et al. 2006; Sawyer et al. 2009). Given the widespread agricultural uses and resultant degradation of natural habitat and drainage patterns in the study

area, impacts on special-status plants, habitats, waters of the U.S., and waters of the state would be **much less than at the proposed HHSEGS site**.

No threatened or endangered wildlife are known to inhabit the area, and remaining native vegetation would likely not support threatened or endangered wildlife species such as the desert tortoise (*Gopherus agassizii*), which is *state and federally listed as threatened*. Impacts on special-status wildlife species would be **much less than at the HHSEGS site**. Under this alternative, potential impacts on terrestrial biological species and habitats at the Sandy Valley Off-site Alternative site could be reduced to less than significant with implementation of mitigation measures.

Avian impacts would stem from loss of habitat, collisions with project features, and injury or mortality from exposure to concentrated solar flux in the airspace over the heliostat field. Operational impacts of the proposed project would mainly affect avian species, including raptors, through exposure to concentrated solar flux. While little research-based data exists regarding the effects of power tower technology on avian species, it has been noted that agriculture can attract certain species of birds and bats. A scientific study in the *Journal of Field Ornithology* (McCrary et al. 1986) includes a recommendation that power tower projects "should not be sited in close proximity to open water or agricultural fields." Therefore, impacts on avian species from exposure to concentrated solar flux would **similar to or somewhat greater than HHSEGS**. Feasible mitigation measures to reduce operational impacts on avian species to below a level of significance have not been identified; therefore, this impact would remain significant and unavoidable.

The same authors (McCrary et al. 1986) also noted collisions of birds with heliostats. It is not known if these collisions were secondary to exposure to concentrated solar flux, and it is possible that either retinal damage or damage to flight feathers resulted in collisions. It is also known that anthropogenic structures can polarize light. Polarization occurs when light reflects off the surfaces of built structures, altering the property of the light waves. Polarized light pollution can alter the ability of wildlife to seek out suitable habitat, elude or detect predators, and detect natural polarized light patterns, which can affect navigation and ultimately, dispersal and reproduction (Horváth et al. 2009). Polarized light pollution has been demonstrated to significantly disrupt insect breeding behavior (Horváth et al. 2010). With the potential attractive qualities of the nearby agricultural fields, avian impacts from collisions with project features such as the power towers, heliostats, and other elevated buildings and power lines would be **similar to or somewhat greater than HHSEGS**. Feasible mitigation measures to reduce operational impacts on avian species to below a level of significance have not been identified for the proposed project. Like the proposed project, this impact would remain significant and unavoidable under the Sandy Valley Off-site Alternative.

Groundwater levels in the aquifer underlying the Mesquite Valley have been declining since the latter part of the 1900s (California Department of Water Resources 2004), yet not to as great an extent as the decline in Pahrump Valley. Declines in groundwater levels primarily impact phreatophytes, or plants with deep roots that draw upon groundwater. Degradation of those types of plants may cause further degradation of the

environment and could impact associated special-status plants and wildlife. DFG has mapped mesquite bosques approximately 3 miles southeast of the Sandy Valley alternative site (DFG 2012). Mesquite is a phreatophyte. Staff has determined that impacts on the groundwater basin under this alternative would be "similar to HHSEGS" and could be mitigated to below a level of significance (see the subsection below, "Water Supply," for this alternative). Agricultural use has likely limited the presence of unmapped phreatophytes in the Sandy Valley study area; therefore, the effect of declining groundwater levels on groundwater dependent species is **somewhat less than HHSEGS** under this alternative. For the proposed HHSEGS project, conditions of certification are recommended to reduce the level of significance for potential impacts on water resources. (Refer to the **Water Supply** section of this staff assessment for a discussion of groundwater resources.) The same or similar conditions of certification could also be implemented at the Sandy Valley site, which would reduce potentially significant impacts on groundwater-dependent species (e.g., mesquite bosques) to less than significant.

Cultural Resources

This analysis is based on information from records searches conducted on behalf of staff by the San Bernardino Archaeological Information Center and the Eastern Information Center of the California Historical Resources Information System, and the Harry Reid Center for Environmental Studies at the University of Nevada, Las Vegas. Staff also relied on draft results of primary ethnographic research conducted by staff for the proposed project. Staff's analysis of available maps and remote imagery contributed key information. Absent more intensive research on the Sandy Valley Off-site Alternative site, the conclusions of this analysis have a significant margin of error.

Based on the discussions below of the environmental contexts and potential effects of the Sandy Valley Off-site Alternative on cultural resources, impacts under this alternative would be **somewhat greater than those of the proposed HHSEGS project**.

Environmental Setting

Natural Setting

The present climate in the proposed project region represents a moderately dry and harsh period relative to the last 12,000 years, the minimum timeframe for a human presence in the Mojave Desert. Since the late Pleistocene epoch (prior to 10,000 years ago), Mojave Desert climate can be split into three broad phases:

- *Pleistocene* – This geological epoch was much more moist or mesic relative to the present climate, which led to the development of a number of large permanent lakes on the floors of the region's valleys.
- *Early Holocene* – The lakes slowly evaporated during the early Holocene epoch (10,000 years ago to present) as the climate progressively became more arid.

- *Mid-Holocene Altithermal* – The period from approximately 5000 to 3000 B.C. marks a time of extreme aridity, often referred to as the mid-Holocene Altithermal (Antevs 1948), and the final desiccation of the lakes in the region.

The climate since approximately 3000 B.C. has typically been more mesic relative to conditions during the Altithermal, and evidence indicates particularly wet periods from approximately 1000 B.C. to A.D. 1, and again from approximately A.D. 500 to 1400 (Bamforth 1990, p. 72).

Cultural Setting

Prehistory

A more comprehensive discussion of the prehistory of the eastern Mojave Desert and the vicinity of the Pahrump and Mesquite valleys is in the **Cultural Resources** section of this staff assessment. The background information providing the broader prehistoric context for the proposed project site also applies to the alternative site.

The prehistory of the eastern Mojave Desert is the narrative of how human populations have adapted to marked fluctuations in the local environment over at least the last 12,000 years. The archaeological remains of the region's prehistory are relatively scarce. Sparse scatters of stone tools and chipped stone tool manufacturing debris, and isolated artifacts, resources that typically yield information of marginal value, account for 40 to 60 percent of the archaeological remains found in the Mojave and Colorado Deserts. A relative paucity of intact buried archaeological deposits contributes further to the dearth of information on the prehistory of the region (Lyneis and Macko 1986, p. 52). The availability of water and the location of high-value resource patches in otherwise unproductive habitats appear to influence the distribution of the archaeological sites on the desert landscape (Lyneis and Macko 1986, p. 57; Sutton et al. 2007, p. 230). The broad trajectory of cultural development in the Mojave Desert may be characterized by the steady decline in residential mobility as local populations began to occupy increasingly larger valley or basin bottom base camps, in a few preferred locations and over longer periods of time, rather than working out of temporary camps in particularly productive environmental zones (Bamforth 1990, p. 74).

Ethnography

A broader ethnographic context for the Pahrump Paiute, the Native American community with the most direct apparent connection to the Sandy Valley Off-site Alternative study area, is in the **Cultural Resources** section of this staff assessment. Most, if not all of the background information provided as the broader ethnographic context for the proposed project site also applies to the alternative site.

The Sandy Valley study area is in the Pahrump Paiute Tribe's ancestral territory. The valley rests between two tribal districts. The Potosi District east of the study area is traditionally represented by Chief To-ko'-pur, who was widely referred to as Chief Tecopa. He was also the head Chief for the larger seven-district ancestral territory of the Pahrump Paiute tribe. Chief Tecopa passed away in 1904. The Mo-quats District west of the study area was represented by Chief Hu-nu'na-wa. The Sandy Valley study

area was part of a commonly used area between the two districts. The Potosi District's center is Potosi Mountain, and the Mo-quats District's center is Kingston Peak. Several springs exist around the flanks of each mountain, which were centers for family units that seasonally traversed the districts' mountains, lower flanks, valley floors and the washes that drain the mountain slopes and eventually lead to Mesquite Dry Lake. Some of the significant springs that anchored family units in the vicinity of the Sandy Valley alternative study area are Potosi Spring, Cave Spring, Horsethief Spring, and Cave Spring. Although Pahrump tribal families have since moved away from the springs to Pahrump or Las Vegas or other areas, the Sandy Valley area and the mountains to the east and west of the valley are still used by Pahrump Paiute for traditional purposes.

History

Various historic-era transportation corridors/roads traverse the valley, and late-19th century homesteads and mines and mining-related features dot the region. The Sandy Valley Off-site Alternative site is between the Goodsprings and Ivanpah mining districts and in the Old Spanish Trail-Mormon Road corridor. Goodsprings Mine and Ivanpah Mine are approximately 15 miles east and 40 miles south of the Sandy Valley alternative site, respectively.

Extant Alternative Site Information

Cultural Resource Inventory

Results of the records searches conducted for the Sandy Valley Off-site Alternative indicate a relative dearth of cultural resources on the alternative site; however, one previous investigation is recorded for the alternative site (Knight and Leavitt 2003). An intensive pedestrian survey was done together with a land exchange between the American Gear Reduction Company, BLM's Barstow Field Office, and Death Valley National Park. A total of approximately 3,747 acres was surveyed on six discontiguous parcels. Parcels 2 and 3 (Knight and Leavitt 2003, Survey Area Maps 2 and 3 of 4, respectively) of the survey area cover a total of approximately 573 acres of the Sandy Valley Off-site Alternative site, which represents approximately 17.1 percent of the 3,354-acre site. The survey of parcels 2 and 3 resulted in the discovery of one prehistoric archaeological deposit (CA-SBR-12121) of groundstone fragments, chipped stone debris, and fire-affected rock; one complete prehistoric sandstone metate (CHRIS Primary No. 36-020480); one historical archaeological site (CA-SBR-12124H), a probable former homestead that includes a grave from 1940, a wellhead, and two historic refuse scatters; two complete glass condiment jars dating to the 1940s and recorded as one historical archaeological isolate (CHRIS Primary No. 36-020488); and the remains of what may be an historic irrigation ditch (CA-SBR-12123H). Study of available maps and remote imagery reveal a few scattered homes and farming operations on some properties in the study area. (See the "Land Use" subsection below for a description of land uses on the alternative site.) The buildings on the site appear to consist of non-historic age single-family homes and associated structures (e.g., sheds, detached garages, etc). Historic aerial photographs show the circular patterns of the sprinkler systems in use after 1958. The 1989 aerial photograph shows only one of the six irrigated crop circles from the earlier photograph.

The prehistory and history of the Sandy Valley area are generally known, and this investigation shows a cultural resources inventory that is broadly consistent with expectations. Prehistoric materials largely include sparse, isolate chipped stone debris, and rarely, small, more diverse deposits of chipped stone, groundstone, and fire-affected rock. These artifacts represent a light, transitory prehistoric use of the Mesquite Valley floor approximately 8 miles northwest of the center of Mesquite Lake playa. The character of the known archaeological deposits along the valley margins and the zone of relict former shorelines around Mesquite Lake indicate, at least, a later, more intensive prehistoric use of those areas. Most of the known historical archaeological materials on the alternative site represent the cycle of homesteading that General Land Office records indicate took place from approximately 1925 through 1936. Built-environment resources, including buildings, structures, and linear infrastructure elements, show evidence of the mid- to late-20th century farming operations and rural residential uses in the area. A segment of an apparent wagon road that has been identified as the 1880s Hay Road terminates outside of the alternative site's south-central boundary. No further evidence of the road has been identified on the alternative site.

A complete analysis of the potential effects of the Sandy Valley Off-site Alternative on cultural resources would require an assessment of the uses of the known inventory of archaeological and built-environment resources on the site. Extant data limitations would be identified and also considered. The prior archaeological data represents a small portion of the floor of the Mesquite Valley that did not include the valley margins where prehistoric archaeological deposits are more likely to be found. Therefore, the sample surveyed area may underrepresent the actual number of archaeological resources on the alternative site. Conversely, the mid- to late-20th century farming uses have probably disturbed or obliterated surface prehistoric and historical archaeological deposits in the area, which could also indicate potential losses of archaeological deposits in the valley margins. Farming uses might have obliterated the segment of the Hay Road that may have traversed the Sandy Valley study area. A pedestrian survey of the rest of the alternative site would be necessary to verify the extent of farming uses and note the locations and condition of disturbed archaeological deposits in those areas. This information would help establish the original frequency of surface archaeological deposits across the alternative site and also function as a potential index of the distribution of subsurface archaeological resources. The lack of information on the geoarchaeology of the alternative site and the limitations of the one extant pedestrian survey sample make it difficult to assess the potential presence of subsurface archaeological deposits and the effects of this alternative on any such deposits, if they are present. A built-environment reconnaissance or survey of the site would be necessary to verify the results of staff's analysis of available maps and remote imagery.

Complete studies have also not been conducted to identify all ethnographic resources in and around Sandy Valley. However, several resources were identified in the broader ethnographic studies for the proposed HHSEGS project, approximately 15 miles northwest of the Sandy Valley study area. These are the known ethnographic resources near the alternative site:

- *Potosi Mountain* – A vision questing place.
- *Sandy Valley* – The Coyote Trail Song goes through Sandy Valley. The valley is also the locale featured in a Pahrump Paiute legend concerning a large prehistoric bird, its large egg, and a Pahrump Paiute man that survives an encounter with the bird. The bird preyed upon humans.
- *Kingston Mountains* – A legend concerns Owl, who made his home in the Kingston Mountains. One of Owl's many feats was the creation of the Kingston Mountains as a way to turn the Colorado River towards its current course. The mountains continue to be a place where pinyon nuts are gathered, and bighorn sheep and deer are hunted.

Potential for Significant Cultural Resources and Character of Resource Values

Absent complete archaeological and built-environment surveys, a geoarchaeological analysis, and an ethnographic study, it is difficult to evaluate the likelihood of occurrence or character of any relatively intact, historically significant cultural resources that may be present on the alternative site or in its vicinity. Cultural resources may be on the alternative site or nearby that could potentially be historically significant for their informational and associative values. In general terms, resources could include relatively well-preserved transient prehistoric camps on the valley floor; larger, more long-term camps toward the valley margin; and archaeological remains of early-20th century homesteads. Based on this initial investigation, built-environment resources on the alternative site appear unlikely to be determined historically significant.

A number of linear cultural resources probably traverse and extend beyond the alternative site. Linear resources such as prehistoric trails or historic wagon roads, which have the potential to be historically significant for their informational and associative values, have probably been subject to significant degradation on the alternative site as a result of relatively recent farming activities, while the off-site portions of those resources, depending on the nuances of local land use history, may be largely intact. Any on-site trail and road segments may not have retained enough integrity to contribute to the potential historic significance of the whole linear resource(s). Intact off-site segments may retain their integrity. The alternative site and its vicinity are in the broader area of the Old Spanish National Historic Trail corridor. Intact segments of the Old Spanish Trail and the Mormon Road that relate to the broader management corridor and that could contribute to the historic significance of this National Historic Trail may exist within sight of the Sandy Valley Off-site Alternative study area. If that assumption is correct, those segments would be considered in a detailed analysis of this alternative.

The Sandy Valley Off-site Alternative could potentially degrade the visual integrity of archaeological, built-environment, and ethnographic resources both on the alternative site and in its vicinity. Off-site archaeological deposits and built-environment resources that may be historically significant for their associative values could potentially be subject to this visual degradation. Based on this initial investigation, off-site archaeological resources vulnerable to a substantive loss of integrity due to visual degradation would include clusters of the same types of transient prehistoric camps on

the valley floor that were found on the alternative site, and the larger, more long-term camps that could be present toward the valley margin. Without further analysis, it is difficult to envision how individual resources like these would be found to be historically significant for their associative values. It is possible that a multiple-deposit district of such resources, were such a district to be present in the vicinity of the alternative site, could have the potential to be historically significant for its associative values, and as a consequence, any potential loss of visual integrity would need to be considered.

Staff's review of satellite imagery and interpretation of visual vegetation association signatures indicate the potential presence of a mesquite bosque-coppice dune landscape component approximately 3.3 miles southeast of the alternative site. This vegetation association is along apparent former shorelines north of the Mesquite Lake playa that may be analogous in structure, integrity, and historic significance to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape identified immediately northeast of the proposed project site. Both resources overlie the Pahrump Valley fault zone, which is a segment of the Stateline fault zone discussed in the **Geology and Paleontology** section of this staff assessment. The cultural resources analysis for the proposed HHSEGS project addresses the influence of the fault zone on creation and sustenance of the vegetation association of the archaeological landscape. Additional research would be needed to verify the presence of an analogous resource near the Sandy Valley alternative site.

Based on records search data that encompass a substantial portion of the unincorporated community of Sandy Valley, Nevada, it is unlikely that historically significant built-environment resources are present in the area that could be visually impacted by this alternative.

Environmental Effects and Mitigation Measures

Construction and operation of a renewable energy facility at the Sandy Valley alternative site could potentially physically disturb and visually degrade historically significant cultural resources both on and near the alternative site. Disturbance or destruction of prehistoric and historical archaeological sites that may be on the alternative site could also alter or destroy the integrity of the information for which individual sites may be of value. Mitigation measures would be required to compensate for the loss of those data sets for which each individual archaeological deposit had been found to be significant. Such mitigation measures typically include data recovery excavations.

The potential exists for this alternative to visually impact historically significant prehistoric or historical archaeological districts that may be identified in the vicinity of the alternative site. If further study confirmed the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape analog southeast of the site, mitigation measures would be required for the potential degradation of the setting, feeling, and association for any of these resources and the consequent inability of each respective resource to convey the associative values for which it had been found to be significant. Mitigation measures would specifically address the unique associative values for each impacted resource. Mitigation measures could include higher resolution resource

recordation, sharing of knowledge about subject resources through dissemination of public outreach materials, and implementation of compensatory mitigation.

Based on staff's analysis, any effects that construction and operation of the alternative facility could have on built-environment resources would primarily occur in the vicinity of the alternative site rather than *on* the alternative site. The one known built-environment resource on the alternative site is described above. The only remnants of historic era activity remaining on the site include fences, agricultural equipment, and cleared areas that have not yet been fully reclaimed by the desert. The presence and historic significance of the trail and road segments on and adjacent to the alternative site are unconfirmed; however, if any such resources are present, they may not have retained enough integrity to contribute to the potential historic significance of the whole linear resources. Segments adjacent to or near the alternative site may, in theory, retain such integrity, and could require mitigation measures similar to what is described above for the potential degradation or loss of archaeological resources and their respective associative values.

The potential for construction and operation of the alternative facility to significantly impact ethnographic resources is difficult to assess. Further focused study would contribute to a more substantive analysis of these resources, and as already noted, more comprehensive ethnographic work would be necessary to identify and evaluate a relatively complete inventory of local ethnographic resources. Based on this initial investigation, the alternative facility would constitute an intrusive visual element in Sandy Valley. This alternative would degrade views both from and toward Potosi Mountain and the Kingston Mountains. A more comprehensive analysis would be necessary to assess whether the alternative facility's visual effect on local ethnographic resources would qualify as a substantial adverse change in the significance of those resources determined to be eligible for listing in the California Register of Historical Resources. The Sandy Valley Off-site Alternative could potentially introduce intrusive visual elements into Sandy Valley at a scale that would exceed that of any other built visual elements in the valley. Mitigation measures would be required for the potential degradation of the integrity, setting, feeling, and association for significant ethnographic resources. Mitigation measures could include completing thorough ethnographic investigations to contextualize, document, and interpret the subject resources; and other measures to facilitate the preservation of Pahrump Valley Paiute culture. No feasible mitigation measures would resolve the significant visual effects of the alternative facility on the local ethnographic resources, and the impact would remain significant and unavoidable. A group of views in the valley and beyond that are critical to the fabric of Pahrump Valley Paiute culture would be irreparably compromised.

Comparison to the Proposed Project

Archaeological Resources

Construction and operation of the Sandy Valley Off-site Alternative could cause impacts on prehistoric and historical archaeological resources that would be **somewhat greater than the proposed project**. This off-site alternative may have a more diverse and potentially significant suite of both prehistoric and historical archaeological resources

that would most likely be subject to physical disturbance or destruction. No significant archaeological deposits are known to be located on the proposed project site. The potential effects of this alternative on archaeological resources beyond the alternative site would be comparable to the effects of the proposed project on such resources. The visual effects of this alternative on the potential Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape analog southeast of the alternative site would, in theory, be roughly equivalent to the proposed project's visual effects on the identified Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape. The net on-site effects of this alternative on archaeological resources would be **somewhat greater than those of the proposed project**, and off-site effects would be **similar to HHSEGS**.

Built-environment Resources

Regarding the built-environment cultural resources, development of a solar facility on the Sandy Valley Off-site Alternative site would most likely have a **similar level of effect compared to the proposed project**. A utility-scale renewable energy facility at either location has the potential to significantly impact different portions of the same resource—the Old Spanish Trail-Mormon Road. More site-specific information about the cultural resources on the Sandy Valley alternative site would better qualify this comparison.

Ethnographic Resources

Based on this initial investigation, the potential effect of this alternative on ethnographic resources in Sandy Valley would be **similar to the effects of the proposed project on analogous resources in the Pahrump Valley**. Like the proposed project, no feasible mitigation measures would reduce the significant visual effects of this alternative on local ethnographic resources to a less-than-significant level, and the impact would remain significant and unavoidable. Two groups of views critical to the fabric of Pahrump Valley Paiute culture would be irreparably compromised.

Fire Protection

Under the Sandy Valley Off-site Alternative, potential impacts on local fire protection resources would be similar to the impacts that would occur at the proposed HHSEGS project site. Similar to the proposed project, fire protection resources to serve the local communities are limited in the region that includes the study area for this alternative. Staff concludes that the impacts on local services would be **similar to the proposed HHSEGS project** for this off-site alternative. Impacts on fire protection from construction and operation of the proposed project are evaluated in the **Worker Safety / Fire Protection** section of this staff assessment. Like the proposed HHSEGS project, staff concludes that impacts on the local fire department would be significant under this alternative due to the predicted increase in emergency response calls during project construction and operation. Mitigation measures for these impacts would likely require payment of as yet undetermined project-specific fees to the local fire protection service to enable augmentation of resources such as staff, equipment, and facilities. With implementation of appropriate mitigation measures, impacts on local emergency services would be reduced to less than significant.

Geology and Paleontology

The Sandy Valley Off-site Alternative is located in the Mesquite Valley, approximately 17 miles southeast of the proposed HHSEGS site. Mesquite Valley is in an active geologic area along the border between southern California and southern Nevada, approximately 35 miles southwest of Las Vegas, Nevada, and 80 miles southeast of Death Valley. The alternative site could be subject to strong levels of earthquake-related ground shaking. The closest known active fault is a segment of the Stateline fault zone, which is immediately adjacent to the site's eastern boundary along the border between California and Nevada. Additional active faults in the vicinity are the Garlock fault (30 miles southwest of the alternative site) and the Southern Death Valley fault zone (33 miles southwest).

Mitigation measures would be required to reduce the effects of strong ground shaking on structures at the Sandy Valley Off-site Alternative site to the extent practicable. Mitigation measures would address structural design requirements consistent with requirements of the most recent edition of the California Building Code (CBC) (California Building Standards Commission 2010), which requires that structures be designed to resist seismic stresses from ground acceleration. Implementation of feasible mitigation measures would reduce potential impacts on structures that could be affected by strong ground shaking to less than significant.

The alternative site could also be subject to soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction. A design-level geotechnical investigation would be required for this alternative consistent with CBC requirements (California Building Standards Commission 2010), and conditions of certification would be recommended, including implementation of standard engineering design requirements to reduce the effects of strong seismic shaking and potential excessive settlement due to collapsible soils, formation of soil fissures, and/or dynamic compaction. With implementation of mitigation measures, these impacts would be reduced to less than significant.

No known viable geologic or mineralogical resources are present at the proposed Sandy Valley Off-site Alternative site. Unique geological features (paleosprings) that exist east of the site are associated with fault scarps belonging to segments of the Stateline fault zone. There is no evidence of paleosprings on the site. However, channels and associated deposits formed by flows from these springs may traverse the site. Potential impacts on paleontological resources due to construction activities would be mitigated to less than significant through worker training and monitoring by qualified paleontologists.

Environmental Impacts Pertaining to Both Sites

Like the proposed project, the potential for geologic hazards to cause significant adverse impacts on this alternative's project facilities during its design life would be low. Similarly, the potential for construction, operation, and closure of either the proposed project or this alternative to cause significant adverse impacts on geological, mineralogical, and paleontological resources would be low. Like the proposed project,

design and construction of the Sandy Valley Off-site Alternative would be completed in accordance with all applicable LORS, and in a manner that protects environmental quality and assures public safety, to the extent practicable.

Environmental Impacts Compared to the Proposed Project

Due to the documented occurrence of fissure development in the Pahrump Valley, the proposed project has some susceptibility to soil failure caused by earth fissuring. Conversely, documentation of ground fissuring in the Mesquite Valley was not found. Therefore, the Sandy Valley Off-site Alternative has a lower susceptibility to ground fissuring than does the proposed project. Overall, potential impacts on geological and paleontological resources under this alternative would be **similar to HHSEGS**. As discussed above, implementation of all feasible mitigation measures would reduce potential impact on geological and paleontological resources to less than significant.

Hazardous Materials

Under the Sandy Valley Off-site Alternative, the project elements and major facility components would be similar to those associated with the proposed HHSEGS project. As discussed in the **Hazardous Materials** section of this staff assessment, conditions of certification requiring conformance with applicable LORS would reduce potentially significant impacts to less than significant. Staff did not identify any new or more severe significant off-site impacts posed by hazardous materials use at the alternative site. The potentially significant impacts under this alternative would be **similar to HHSEGS**.

Land Use

Environmental Setting

The study area for the Sandy Valley Off-site Alternative includes land in Inyo and San Bernardino counties. The Sandy Valley study area is sparsely developed with agricultural uses on some properties. Based on a review of Google Earth aerial images, several structures, including a few residences, are located in the study area near farmed properties. Parcels at the Sandy Valley study area are shown in **Alternatives Figure 3**. The subsections that follow describe the land use effects of a renewable energy facility at the Sandy Valley alternative site. Refer to the subsection, “Socioeconomic Resources,” (below) for a discussion of the potential effects of this alternative on landowners.

Inyo County General Plan

The northern portion of the area identified as the Sandy Valley Off-site Alternative is designated Agriculture (A) in the Inyo County General Plan (Inyo County 2001). The Agriculture land use designation provides for agricultural uses on land that is suited for the production of food and fiber on a regular and sustained basis, limited agricultural support services, agriculturally-oriented services, agricultural processing facilities, public and quasi-public uses, and certain compatible nonagricultural activities (Inyo County 2001). The Agricultural Resources Element includes a goal to “provide and maintain a viable and diverse agricultural industry in Inyo County.” Related Policies AG-1.2 and AG-1.3 address supporting continuance of agricultural production activities in the county

and discouraging the conversion of productive agricultural lands for urban development. The Land Use Element includes Policy LU-1.6, "Sandy Valley," which states that "[t]he County shall preserve agricultural and related open space uses on private lands in Sandy Valley and will not designate additional land for rural residential development." The Inyo County General Plan applies to all parts of the county, including lands that are managed by the federal government (Hart, pers. comm., 2012).

A February 23, 2012, letter from Inyo County to BrightSource Energy, Inc. describes Inyo County requirements to ensure consistency of the proposed project with the Inyo County General Plan (Inyo County 2012c). Inyo County staff lists options to bring the proposed project into consistency with the Land Use Element; these options also apply to the Sandy Valley Off-site Alternative (Hart, pers. comm., 2012). The applicant's first option is to submit a general plan amendment (GPA) to change the site's land use designation to General Industrial (GI). The second option is to process a GPA for a solar energy development land use designation or overlay that would be applied to the site.

The Sandy Valley Off-site Alternative is in the Open Space (OS) zoning district with a minimum parcel size of 40 acres; the same zoning district applies to the proposed HHSEGS site. Inyo County staff states that power plants are conditionally permitted only in the General Industrial and Extractive (M-1) zoning district (Inyo County 2012c).

Use of the northern portion of the Sandy Valley alternative site for construction and operation of the project would require local land use approvals from Inyo County, including a general plan amendment to ensure consistency of a utility-scale energy facility at the Sandy Valley alternative site with the Land Use Element. A zoning district change or zone text amendment (e.g., creation of a *solar energy zone* or similar overlay) would also be required. Other options to changing the zoning district include applying for a *planned unit development*, *renewable energy development agreement*, and/or a *renewable energy permit*. Each of these agreements would allow a waiver of zoning standards. Construction and operation of an approximately 500-MW renewable energy facility at the Sandy Valley Off-site Alternative site would be inconsistent with Inyo County's general plan land use designation and zoning district for the study area; without a general plan amendment and accompanying zoning change, this impact would be significant and unavoidable.

For the land use impact pertaining to potential conflicts with applicable land use plans, the impact would be **similar to HHSEGS** for the portion of the alternative project site that is in Inyo County. This conclusion is based primarily on discussions with Inyo County staff and planning issues outlined in the February 23, 2012, letter from Inyo County staff.

San Bernardino County General Plan

The southern portion of the area identified as the Sandy Valley Off-site Alternative is designated Resource Conservation (RC) in the San Bernardino County General Plan. This land use designation does not apply to two parcels in the Sandy Valley study area

that are managed by BLM (**Alternatives Figure 3**). The Resource Conservation land use zoning district[4] is intended to encourage limited rural development while maximizing preservation of open space, watershed, and wildlife habitat areas; identify areas where rural residences may be established on lands with limited grazing potential; prevent inappropriate urban population densities in remote and/or hazardous areas of the county; and establish areas where open space and nonagricultural activities are the primary land uses, but where agriculture and compatible uses may coexist. Lands designated as Resource Conservation include "[a]reas with limited or no infrastructure facilities and where none are planned within the next twenty years" (San Bernardino County 2011).

The Sandy Valley Off-site Alternative is located in the Resource Management zoning district, which allows for electrical power generation with approval of a conditional use permit (San Bernardino County 2012). Chapter 84.29 of the San Bernardino County Development Code addresses specific use regulations that apply to the establishment, maintenance, and decommissioning of renewable energy generation facilities. The Resource Conservation land use zoning district is one of several identified in Subsection 84.29.040 as allowing development of renewable energy facilities (San Bernardino County 2012).

Use of the southern portion of the Sandy Valley alternative site for construction and operation of a renewable energy project requires local land use approvals from San Bernardino County, including a conditional use permit for construction of an electrical power generation facility in the Resource Management zoning district. Compliance with the standards and permit procedures of Chapter 84.29 of the San Bernardino County Development Code would be required.

For the land use impact pertaining to potential conflicts with applicable land use plans, the impact would be **less than HHSEGS** for the portion of the alternative project site that is in San Bernardino County. This conclusion is based primarily on the fact that a renewable energy facility is an allowable use in the Resource Conservation land use zoning district.

Conclusion Regarding Potential Inconsistencies with General Plan Land Use Designations and Zoning

For the Sandy Valley Off-site Alternative study area as a whole, the impact pertaining to consistency with applicable plans and policies is **similar to HHSEGS**, and the impact is significant and unavoidable without a general plan amendment and zoning district change.

[4] San Bernardino County uses the term *land use zoning district* instead of *land use designation*; the latter term is more commonly used by local jurisdictions to identify designated land uses referenced in general plans.

Northern and Eastern Mojave Desert Management Plan

The study area for the Sandy Valley Off-site Alternative includes three noncontiguous parcels under federal management totaling approximately 657 acres (**Alternatives Figure 3**). These vacant, undeveloped parcels are presumed to be within the planning area of the Northern and Eastern Mojave Desert Management Plan (NEMO Plan), which was adopted in 2002 as an amendment to the CDCA Plan. The Record of Decision (ROD) approving the NEMO Plan describes several plan amendment decisions (BLM 2002). A partial list of topics addressed in the NEMO Plan includes the following:

- Establishment of regional standards for public land health and guidelines for grazing management.
- Establishment and management of areas for protection of sensitive species (e.g., desert tortoise).
- Management of areas for wild horses and burros.
- Identification of several river segments for potential inclusion in the National Wild and Scenic Rivers System.
- Establishment of the Amargosa River and Carson Slough Areas of Critical Environmental Concern in the Amargosa watershed.
- Identification of priorities for potential acquisition of private lands and disposal of public lands.

The Pahrump Valley Wilderness encompasses approximately 73,725 acres and is adjacent to the west side of the Sandy Valley Off-site Alternative. None of the properties composing the Sandy Valley study area are inside the Pahrump Valley Wilderness.

The final environmental impact statement for the NEMO Plan includes a land tenure strategy, which identifies public lands in identified disposal areas for potential conveyance out of federal ownership for future private sector use and development and for necessary public purposes (BLM 2002). A few hundred acres of public lands in the Mesquite Valley are identified as unclassified and available for future disposal; parcels identified in this manner include the two BLM properties on the east side of the Sandy Valley Off-site Alternative site (see **Alternatives Figure 3)**. The larger BLM parcel at the southwest corner of the alternative site is not identified in the land tenure strategy for the NEMO Plan.

All actions on public lands must be in conformance with applicable BLM land use plans (43 Code of Federal Regulations § 1610.5-3). Any proposals or actions determined not to be in conformance with these plans would require the analysis of a land use plan amendment. It is stated in the CDCA plan that “[s]ites associated with power generation or transmission not identified in the Plan will be considered through the Plan Amendment process” (BLM 1980). Construction and operation of a renewable energy facility at the Sandy Valley Off-site Alternative could require amending the CDCA plan prior to approving a proposed right-of-way grant for lands that are managed by BLM. Initial steps to coordinate with BLM would include filing Standard Form SF-299,

"Application for Transportation and Utility Systems and Facilities on Federal Lands." For the two parcels at the alternative site that are identified by BLM as unclassified and available for disposal, it is unknown if filing of Standard Form SF-299 would be required. If these properties remain under federal management, some type of agreement for their use or purchase could be required.

Potential Conversion of Agricultural Land

The Farmland Mapping and Monitoring Program does not maintain Important Farmland data for most of the state east of the Central Valley and the Sierra Nevada. However, several properties in the area of the Sandy Valley Off-site Alternative are in agricultural use. Alfalfa for hay, garlic, and potatoes are currently grown on the site or in the surrounding area, and three new groundwater wells were recently constructed to provide water for irrigation (Milovich and Cleland, pers. comms., 2012). The crops being grown in the Mesquite Valley are generally water intensive. Although sod used in landscaping has been grown at the site, the housing downturn in Las Vegas decreased the demand for sod to such an extent that production has practically ceased. Relatively low land values, an available groundwater supply, and a potential market for the crops that are produced have generally contributed to the success of farming operations in the Mesquite Valley (Cleland, pers. comm., 2012). For example, alfalfa for hay feeds dairy cattle in the Central Valley (Miller, pers. comm., 2012). A total of approximately 2,050 acres of land are irrigated for agricultural uses in the Mesquite Valley area of the two California counties (Milovich and Cleland, pers. comms., 2012). Based on staff's review of aerial photographs for 2008 and 2009, a total of approximately 750 acres of land may be cultivated and irrigated in the study area.

Construction and operation of a project at the site would convert approximately 750 acres of existing farmland to a nonagricultural use. Of the total acreage, approximately 325 acres are designated Agriculture (A) in the Inyo County General Plan. No agricultural land is present at the proposed HHSEGS project site. The impact related to conversion of agricultural land would be **much greater than HHSEGS** at the Sandy Valley Off-site Alternative site, and this impact is considered significant. As discussed above, construction and operation of a utility-scale renewable energy facility at the Sandy Valley alternative site would require a GPA for the portion of the site that is in Inyo County. A zoning district change or other type of agreement with Inyo County would also be required.

Implementation of one or more conditions of certification would be required to reduce the impact of converting the total approximately 750 acres of existing agricultural land to nonagricultural use. The project applicant could be required to coordinate with the Agricultural Commissioner's Offices for the two counties to determine appropriate compensation for the conversion of agricultural land. Implementation of conditions of certification would reduce the impact of conversion of agricultural land to less than significant.

Noise and Vibration

This site is located approximately 20 miles southeast of the proposed HHSEGS site and has a similar topography as the HHSEGS site. The surrounding area is populated with

slightly more noise-sensitive receptors than the proposed HHSEGS site. The noise impact is estimated to be **somewhat greater than HHSEGS** due to the higher number of receptors near the site, including a community center with recreational and administrative uses and sparsely developed residential uses. Like the proposed project, conditions of certification would be required to ensure that potentially significant noise impacts were reduced to less than significant during project construction and operation.

Public Health

Under the Sandy Valley Off-site Alternative, the project elements and major facility components would be similar to those associated with the proposed HHSEGS project; therefore, toxic air emission levels under this alternative would be **similar to HHSEGS** for construction and operations emissions. Existing land uses at this alternative site include agricultural and rural residential uses. Residential development in the unincorporated town of Sandy Valley, Nevada, is somewhat greater than at the proposed HHSEGS site in the Charleston View area. Given the somewhat greater density of housing development in the Sandy Valley area, air toxics-related health risks could be slightly greater under this alternative. As discussed in the **Public Health** section of this staff assessment, potential air toxics-related impacts from operation of the proposed HHSEGS project would be below significant levels within the 6-mile radius of typical concern to staff; therefore; potential impacts within the same 6-mile radius from the Sandy Valley Off-site Alternative would also be less than significant, and no conditions of certification would be required. This impact would be **similar to HHSEGS**.

Socioeconomic Resources

The Sandy Valley Off-site Alternative includes land in Inyo and San Bernardino counties. Due to the remote location of the study area and the fact that it would be situated in both counties, providing emergency medical and law enforcement services to the study area would be similarly challenging as the proposed HHSEGS site. This impact would be **similar to HHSEGS**.

The Inyo County portion of the study area is in the service areas of the Southern Inyo Fire Protection District (SIFPD) and Inyo County Sheriff's Department. There is no paved access to the study area from Inyo County. If the Inyo County Sheriff and SIFPD were to provide service, they would have to travel through Clark County, Nevada, or San Bernardino County to access the study area (Hidden Hills Solar I and II, LLCs 2012b).

The San Bernardino County Sheriff's Department and San Bernardino County Fire Department (SBCFD) have jurisdiction in San Bernardino County. Station #53 of the SBCFD in Baker, California, would be the closest fire station in San Bernardino County that could provide fire protection services. The nearest San Bernardino County Sheriff's office to the Sandy Valley Off-site Alternative site is the Barstow Station at 225 East Mountain View Road. The station is approximately 120 miles (a 3-hour drive) from the study area. The Inyo County Sheriff's substation in Shoshone is about the same distance to the study area.

Due to the proximity to Clark County, Nevada, the first responders for fire, medical, or law enforcement emergencies would likely come from Nevada (Hidden Hills Solar I and II, LLCs 2012b). The Clark County (Nevada) Fire Department would be called upon if needed, and as available, through a Mutual Aid Agreement with SBCFD. Within Clark County, police protection services are provided by the Las Vegas Metropolitan Police Department (LVMPD). The LVMPD is a joint city/county police force providing law enforcement services for all of Clark County, including the City of Las Vegas, with over 2,800 sworn officers (LVMPD 2010).

There are several structures near the farmed properties in the Sandy Valley study area, and a few of them are residences (Hidden Hills Solar I and II, LLCs 2012b). Although zoned Rural and Open Space, no residences are located at the proposed HHSEGS site. The impact of displacing existing rural residences would be **greater than HHSEGS** under this alternative; however, the impact would be less than significant because acquisition of properties would include appropriate compensation to the landowners displaced by this alternative.

Section 17620 of the Education Code (school impact fees) would apply to this alternative. Fees would be payable to either the Death Valley Unified School District in Inyo County, or the Baker Valley Unified School District in San Bernardino County, or both, depending on the locations of project buildings relative to the district boundaries.

The beneficial impact through construction employment and increased taxes and fees would be **similar to the proposed HHSEGS project**.

Traffic and Transportation

The transportation network in the vicinity of the Sandy Valley Off-site Alternative study area consists primarily of local roadways with limited access and state-maintained freeways. Due to the remote location of the study area and the possibility that local roadways are not designed to withstand frequent and heavy construction traffic, use of the existing roadway network during construction phases would be similarly challenging as the proposed HHSEGS site.

Access to the site is provided from two directions. The first is Sandy Valley Road, originating from Goodsprings, Nevada, northwest of Jean, Nevada, at I-15. The second access is from Nevada SR 160 to Pahrump Road, and then south to Sandy Valley. Pahrump Road is a 12-mile unpaved road. In addition to state, federal and county-maintained roads, there are numerous dirt roads throughout the area located along section lines and along the California/Nevada border (Hidden Hills Solar I and II, LLCs 2012b).

Construction workers would most likely use I-15 to commute to the alternative site from Primm, Nevada, approximately 33 miles south of the Sandy Valley study area. Workers could also commute from Las Vegas, which is approximately 45 miles east of the study area.

The addition of a similar number of daily trips as those identified for the proposed HHSEGS project (4,000 daily trips [3,820 automobile trips and 180 truck trips] are predicted for *peak month 19* under the proposed project) would have a significant impact on the structural integrity of Sandy Valley Road and Pahrump Road due to the current and future conditions of the roadway pavement. Under the proposed project, the access roads are not designed to current public works standards for the amount of the proposed construction traffic. Conditions of certification would be required to ensure that impacts on roadways from increased use for construction traffic were avoided or reduced. This impact would be **similar to HHSEGS**. With implementation of conditions of certification, impacts related to traffic and transportation would be reduced to less than significant.

Airport

The closest public-use operational airport to the study area is the Sky Ranch Airport, located in Nevada, approximately 2 miles southeast of the Sandy Valley Off-site Alternative study area. Sky Ranch Airport averages 57 aircraft flights a week (AirNav 2012). Similar sized solar towers at the Sandy Valley site could pose an obstruction hazard to aircraft. Because of the solar tower height, the applicant would be required to notify the Federal Aviation Administration (FAA) of construction pursuant to the Code of Federal Regulations, Title 14, Aeronautics and Space, Part 77. These regulations require FAA notification for any proposed structure over 200 feet in height above ground level (AGL), regardless of the distance from an airport. The impacts would likely be similar to those of the proposed project as both projects would require review and approval by the FAA. This impact would be **similar to HHSEGS**.

Glint and Glare

Similar to the proposed project, glare and/or excessive perceived brightness from the heliostat mirrors and the glowing solar receiver steam generators (SRSGs) at the tops of the power towers could impact motorists in the vicinity of the alternative site and potentially compromise driver performance. Glare can cause difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlamps at night. Glint can cause difficulty seeing in the presence of a transient bright light source and is generally considered to be intermittent.

Staff concludes that the proposed HHSEGS project would pose no risk for photothermal retinal damage, and the potential for photochemical damage to residents and motorists is less than significant (see **Appendix TT 1**, **Glint and Glare Safety Impact Assessment**). Glint and glare can also affect aircraft pilots in the area. Staff concludes that the glint and glare effects from the heliostats would be mildly discomforting to pilots with the potential to be significantly discomforting under certain low probability conditions. Based on the analysis for the proposed project (see the **Traffic and Transportation** section and **Appendix TT 1** in this staff assessment), the glare effects from the SRSGs are unavoidable and would produce a distinct visual distraction effect. However, these glare effects are not considered to be sufficient to be visually debilitating and thus would not cause a safety hazard from an operator control perspective, such as operating a vehicle or flying an airplane. A condition of certification

is proposed in the **Traffic and Transportation** section requiring preparation and implementation of a "Heliostat Operations Positioning and Monitoring Plan." (See Condition of Certification **TRANS-8** in this staff assessment.)

The project elements and major facility components of this alternative would be the same as those of the proposed HHSEGS project. It is assumed that potential impacts related to glint and glare would be **similar to the proposed HHSEGS project**.

Transmission Line Safety and Nuisance

Under the Sandy Valley Off-site Alternative, the project's elements and major facility components would be similar to those that would be constructed at the proposed project site.

The project applicant provided a data response showing a potential transmission line alignment for the Sandy Valley Off-site Alternative (see **Alternatives Figure 4**) (Hidden Hills Solar I and II, LLCs 2012b). The potential alignment for the transmission line would exit the east side of the alternative site study area in California to generally parallel Quartz Avenue through Sandy Valley, Nevada, before turning northeast to parallel Kingston Road east of Sandy Valley.

Based on a review of Google Earth aerial images, the Sandy Valley Library, several single-family residences, and Peace Park are adjacent to Quartz Avenue where the transmission line associated with this alternative could be sited. Staff observes that no studies have been done on the potential feasibility of constructing a 230-kV transmission line along the described route. If it was determined that further work was needed to evaluate this alternative, it would include an analysis of the potential effects of the transmission line on the Sandy Valley community. Like the proposed project, this alternative transmission line would be subject to applicable design and operational plans and requirements and regulations of CPUC.

Sky Ranch Airport is a small, public-use airport in Sandy Valley, Nevada, near the southeast corner of the Sandy Valley alternative study area. The airport has two runways, including a 3,340-foot asphalt runway and a 3,300-foot dirt runway (AirNav 2012). As discussed in the **Transmission Line Safety and Nuisance** section of this staff assessment, notification of the FAA is required for structures that could cause obstruction hazards in navigable space. The transmission line associated with this alternative could be less than 1 mile from the two runways at Sky Ranch Airport; therefore, notification of FAA would be required if this transmission line was proposed for construction along Quartz Avenue. Compliance with applicable regulations and standards would be required to ensure that the transmission line for this alternative would not cause aviation hazards.

The magnitude of these transmission line-related impacts would be similarly less than significant under the Sandy Valley Off-Site Alternative as for the proposed project at the HHSEGS site. This impact would be **similar to HHSEGS**.

Visual Resources

Environmental Setting

The Sandy Valley Off-site Alternative site is best accessed from Sandy Valley Road, leading from Goodsprings, Nevada to the valley. Goodsprings is northwest of Jean, Nevada, at I-15. Sandy Valley Road passes through a small mountain range that includes Table Mountain. The road is narrow and windy as it climbs through the range, and views are enclosed. The road straightens as it descends to the valley floor. Panoramic views from the Sandy Valley area include Black Butte to the northwest, in the southern portion of the Pahrump Valley Wilderness, and the Kingston Range to the west. An alternate route into Sandy Valley is from Nevada SR 160 and Pahrump Road, a 12-mile, unpaved road. There is no route through the valley for most motorists. **Alternatives Figure 6** shows views of the Sandy Valley area.

The study area for the Sandy Valley Off-site Alternative is partly enclosed by the Pahrump Valley Wilderness to the northwest, the North Mesquite Mountains Wilderness to the southwest, and the Mesquite Wilderness to the south, all located in California. BLM wilderness areas by their very nature are of high scenic quality.

Staff conducted a site visit to the study area in January 2012 and observed sparse rural development near farmed properties, including a few residences. Roughly 750 acres in the study area are potentially farmed, using a circular irrigation technique that is distinct from aerial views and, to some degree, on the ground because of the unique equipment in use. Residences and associated outbuildings have low-profiles, and no structures appear to exceed two stories in height. The streets are unpaved, and some existing transmission poles are visible along an unnamed north-south oriented street that intersects with Stateline Road. Another transmission line runs east-west along West Nickel Avenue north of and parallel to Quartz Avenue. Quartz Avenue coincides with the county line between Inyo and San Bernardino counties.

Sandy Valley is a residential community. As discussed above, 2010 U.S. Census data records 811 housing units at an average density of 14.5 units per square mile. A community center with a library, ball field, park, and administrative services is located at the intersection of Quartz Avenue and Osage Street in Sandy Valley; these community facilities are adjacent to the east side of the Sandy Valley Off-site Alternative study area. Staff observed a café, store, and post office in Sandy Valley. The Sky Ranch Airport is in Nevada near the southeast corner of the study area. Refer to the subsections, “Traffic and Transportation,” and “Transmission Line Safety and Nuisance,” for discussions of this airport.

The Sandy Valley area generally has a higher number of permanent viewers (residents) and a lower number of transient viewers (motorists) than the proposed HHSEGS project in Charleston View. The Sandy Valley alternative site has scenic backdrops in the form of wilderness areas, although the scale of landscape features and visual drama is somewhat lower than in the Charleston View area. Like Charleston View, the landscape is disturbed at ground level, but no tall structures pierce the horizon line of the surrounding ranges. The topography and vegetation are more variable than in

Charleston View, with some thickets of desert trees and some rise and fall of the ground plane partially obscuring some of the distant views.

Views from the community of Sandy Valley toward this alternative site are unimpeded by major obstacles, but visual clutter in the foreground at ground level (e.g., structures and minor topography changes) interrupt the panoramic views of the mountain ranges in the background (**Alternatives Figure 6**). The few trees that are noticeable in foreground views partially block middle ground and background views.

Environmental Impacts

Construction-related visual impacts would be **similar to the proposed HHSEGS project**. Views during project construction phases would include views of equipment, stored materials, and the rise of the towers and cranes. At ground level, much of the construction activity would be screened, and conditions of certification would be implemented to screen views and reduce the impacts of construction area lighting. No feasible mitigation measures would screen views of the towers and cranes during construction. These structures would be visible from the Sandy Valley community, the Pahrump Valley Wilderness Area, and possibly from portions of the North Mesquite Wilderness Area and Kingston Range.

Project operations impacts would be **similar to the proposed HHSEGS project,** and similar conditions of certification would be implemented to reduce impacts on visual resources. With part of the alternative site located in San Bernardino County, this alternative may not be consistent with the San Bernardino County General Plan goal and related policies for the desert region. The Conservation Element includes a goal to "[p]reserve the unique environmental features and natural resources of the Desert Region, including native wildlife, vegetation, water and scenic vistas" (San Bernardino County 2011). Many of the project structures would not be consistent with the height restriction (35 feet maximum) for the Resource Conservation land use zoning district. No scenic routes are located in the vicinity of the Sandy Valley alternative site. The Conservation Element includes a goal to "[p]reserve the dark night sky as a natural resource in the Desert Region communities" (San Bernardino County 2011). With implementation of conditions of certification, this alternative would likely be consistent with the San Bernardino General Plan goal and related policies for all lighting to be in accordance with the Night Sky Protection Ordinance.

Similar to the proposed project, for the portion of the alternative site that is in Inyo County, the Sandy Valley Off-site Alternative could be inconsistent with height restrictions that apply to development in the Open Space (OS) zoning district. This alternative could also be inconsistent with the Inyo County Renewable Energy Ordinance (Title 21) in that it could affect scenic views of the wilderness areas and from the wilderness areas. The Sandy Valley Off-site Alternative would otherwise conform to applicable LORS with implementation of conditions of certification to reduce the visual effects of this alternative.

As discussed above under the subsection, "Land Use," Inyo County would require processing of a GPA and zoning district change or zone text amendment to ensure

consistency of a renewable energy project at the Sandy Valley Off-site Alternative site with the Inyo County General Plan.

In general, renewable energy projects that involve use of the SPT technology would cause significant and unavoidable impacts on visual resources. Like the proposed project, this alternative would include a brightly glowing SRSG at the top of each 750-foot-tall (total height) tower. Views of these structures would dominate the landscape at the alternative site. Views of the wilderness areas would be partially blocked and certainly impeded. The number of resident viewers in the Sandy Valley area is considerably higher than in the Charleston View area. These residents would have long-term views of the alternative site. Based on the high numbers of viewers, long duration of views, moderate to high visibility of the alternative site, and high viewer concern (residential), overall visual sensitivity is considered high for this alternative. The introduction of the project components into the landscape, particularly the SPTs, would impede views of the wilderness areas, dominate views of the background mountain ranges, and introduce the stark visual contrast of very large and bright industrialized structures into existing open space views. Therefore, the degree of visual change would be high at the Sandy Valley site. **Similar to the proposed HHSEGS project**, the magnitude of the visual change would cause significant and unavoidable visual impacts at the alternative site.

Conclusion for Impacts on Visual Resources

Like the proposed HHSEGS project, implementation of conditions of certification would reduce potential impacts on visual resources for views at the ground plane. Potential impacts of structural lighting could be reduced to less than significant with implementation of standard conditions of certification to control lighting. No feasible mitigation measures would reduce the visual impacts of the SPTs, brightness of the SRSGs, and potential visual effects of FAA night safety lighting. **Similar to the proposed HHSEGS project**, these impacts would remain significant and unavoidable.

Waste Management

Construction and operation of a renewable energy facility at the Sandy Valley Off-site Alternative site would produce approximately the same amount of waste as the proposed HHSEGS project. There is available Class III landfill capacity in San Bernardino County and Nevada landfills. Similar to the proposed project, staff considers project compliance with LORS and staff's conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the Sandy Valley Off-site Alternative. Impacts related to waste management would be **similar to the proposed HHSEGS project**.

The term, recognized environmental condition (REC), refers to the presence or likely presence of any hazardous substances or petroleum products on a property under the conditions that indicate an existing release, past release, or a material threat of a release of any hazardous substance or petroleum products into structures on the property or in the ground, groundwater, or surface water of the property. The Sandy Valley study area has a higher concentration of agricultural land uses compared to the

HHSEGS project site. Therefore, there is a chance that various parcels could be contaminated with herbicides or pesticides that would require remediation. There was limited agricultural use at the proposed HHSEGS site.

Construction and operation of a renewable energy facility at the Sandy Valley Off-site Alternative site would require preparation of a Phase I Environmental Site Assessment (ESA). Depending on the analysis and conclusions in a Phase I ESA, RECs could potentially be identified in the agricultural area that would require remediation. Impacts related to the potential presence of RECs at the alternative site could be **somewhat greater than HHSEGS**. Mitigation measures would be required to reduce any potentially significant impacts to less than significant.

Soil and Surface Water

Water resources staff participated in a site visit to the Sandy Valley Off-site Alternative study area on January 19, 2012. Average annual precipitation ranges from about 4 to 6 inches, which is similar to the proposed HHSEGS site. Surface runoff from the bordering mountains drains toward Mesquite Lake (California Department of Water Resources 2004), which is an internal drainage lake located approximately 10 miles southeast of the Sandy Valley Off-site Alternative site.

Lahontan Regional Water Quality Control Board identifies the portion of Mesquite Valley located within California as the Mesquite Hydrologic Unit (HU). The Lahontan Basin Plan recognizes “all minor surface waters” and Mesquite Lake as resources of the Mesquite HU. The beneficial use designations, both existing and potential, are the same as those listed for the Pahrump HU’s “all minor surface waters” with the following exceptions:

- Pahrump HU’s minor surface waters potentially supports habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered. (This beneficial use is not listed within Mesquite HU.)
- Mesquite Lake is an inland saline water habitat (supporting inland saline water ecosystems) and it supports natural enhancement or improvement of water quality of other surface waters.

Because the water resources of both HUs have similar beneficial uses, similar conditions of certification could be used to ensure water quality protection at either location. Therefore, impacts from contaminated storm water and discharge of process wastewater would be the same for either location. A septic system for proper disposal of domestic sanitary waste would not change, so these impacts would also remain the same. These water quality impacts would be the **same as HHSEGS** for the Sandy Valley Off-site Alternative.

NRCS soils data is incomplete for the Mojave Desert area on the California side of the state boundary. Based on data extrapolated from the NRCS soil survey, the map unit for an extensive region encompassing the Sandy Valley study area is the Hypoint-Vegastorm association, which has somewhat similar hydrologic properties as the soils

mapped on the proposed HHSEGS site. However, agricultural activity in the study area for the Sandy Valley Off-site Alternative has likely altered much of the area's native soils. With this in mind, staff estimates moderate soil characteristics equivalent to Hydrologic Group C (relatively slow infiltration rates with moderately fine to fine texture). With this assumption, soil erosion impacts during project construction and operations would be **similar to the proposed HHSEGS site**.

The portion of this alternative site that is located within Inyo County is not within the 100-year floodplain (as shown on Federal Emergency Management Agency [FEMA] maps). Maps for the portion of the alternative site located within San Bernardino County are not readily available on FEMA's website. A review of the USGS quadrangle topographic map of the area shows potential ephemeral flows originating from the Spring Mountains in Nevada and traveling through the community of Sandy Valley before entering the Sandy Valley study area and on to Mesquite Lake to the south. Although the site appears relatively flat on the USGS map, ephemeral flows are difficult to predict. Without a comprehensive hydrology analysis, and based on the January 2012 site visit, staff estimates that the hydrology of the Sandy Valley Off-site Alternative site is similar to the proposed HHSEGS site. Therefore, impacts from 100-year flood flows are estimated to be **similar to the proposed HHSEGS project** as well as the potential for on-site/off-site flooding or storm damage.

Water Supply

Groundwater levels in the aquifer underlying the Mesquite Valley have been in decline since the latter part of the 1900s (California Department of Water Resources 2004). Impacts on water supply include potential drawdown of local wells and impacts on groundwater basin balance; these impacts would be **similar to HHSEGS** for the Sandy Valley Off-site Alternative.

For the proposed HHSEGS project, staff developed conditions of certification to reduce these types of impacts to a level that is less than significant. Under this alternative, the same or similar conditions of certification could also be implemented at the Sandy Valley Off-site Alternative site, which would reduce potentially significant impacts on water supply to less than significant.

See the discussion on the potential effects of this alternative on groundwater dependent ecosystems under the subsection, "Biological Resources," above.

SOLAR POWER TOWER (SPT) WITH ENERGY STORAGE ALTERNATIVE

Overview

This alternative would use BrightSource Energy's solar thermal technology with added molten-salt storage at the proposed project site. Thermal energy storage (TES) allows solar energy to be captured during the day and retained in a liquid salt heat transfer fluid (HTF). Liquid salt has inherent TES properties. In its liquid state, salt has a viscosity similar to water. Salt remains in a liquid state at very high temperatures whereas water turns to steam (Energy Commission 2010a). A significant quantity of liquified petroleum

gas (propane) would be used prior to plant start-up for the initial melting, heating, and conditioning of the salt thermal storage medium. No other fossil fuel supply would be required for plant operations.

Like the proposed HHSEGS project, heliostats would concentrate the sun's rays on the water-filled solar boiler at the top of the central receiver tower in each solar field. The resulting high-temperature, pressurized steam would be piped through a conventional steam turbine generator to produce electricity. To store the heat, some of the steam produced during the day would be used to superheat molten salts held in a tank (Press-Enterprise 2012). The heat retained in the molten salts would be available to convert water to steam, which would be used to run the plant's steam turbine generators to produce electricity during solar transients (e.g., cloud cover), and on the *shoulders* later in the evening and earlier in the morning.

This technology offers some additional stability and flexibility of generator operation inherent with liquid salt solar systems that is similar to that associated with supplemental natural gas firing (Hidden Hills Solar I and II, LLCs 2011a). Because this technology uses liquid salt, a medium that can be heated to a very high temperature, the steam cycle is efficient. Because the liquid salt can be stored with very little heat loss, this system allows power to be generated on demand during the day or night regardless of short-term weather fluctuations.

The storage capacity for a BrightSource Energy solar plant with integral thermal storage could be from 3 to 6 hours, which would allow more flexible electricity production (Press-Enterprise 2012). **Alternatives Figure 7** shows an artist's rendering of a power tower project with molten-salt storage.

According to recent CPUC documents, BrightSource Energy proposed adding energy storage to three of the five power purchase agreements (PPAs) with SCE. Of those five PPAs, two applied to the Siberia 1 and 2 solar thermal power plants, which were planned in the Mojave Desert in San Bernardino County. The third solar thermal project, Sonoran West, is being planned for siting in Riverside County approximately 13 miles southwest of Blythe. On October 25, 2012, CPUC rejected the PPAs for one of BrightSource Energy's Rio Mesa Solar Electric Generating Facility (SEGF) projects (proposed without storage) and both of the Siberia projects, which had been planned to include storage. The PPA for the Sonoran West solar thermal project was approved with the proviso that it would include molten-salt storage, and it is currently the only BrightSource Energy project that would incorporate thermal energy storage.

Descriptions of two projects under development that include molten-salt storage are provided below.

Rice Solar Energy Project (RSEP)

RSEP is a 150-MW SPT project that was approved for construction and operation by the Energy Commission in December 2010. SolarReserve will develop RSEP on approximately 1,500 acres of private land in the Colorado Desert in eastern Riverside County.

Similar to BrightSource Energy's solar thermal technology with added molten-salt storage, SolarReserve's projects include a central receiver tower surrounded by heliostats. Instead of super heating water in the solar boiler at the top of the tower, the sun's rays directly heat molten salt that can be stored to generate electricity late at night (Press-Enterprise 2012). The technology used by SolarReserve allows large quantities of thermal energy to be captured and retained for several days and extracted on demand (Energy Commission 2010a). SolarReserve expects RSEP to generate stable, predictable, and controllable electricity.

The Commission Decision for RSEP describes the project technology, stating that RSEP will use liquid salt as the HTF (Energy Commission 2010a). A total of seventy million pounds (4.4 million gallons) of liquid salt will be stored in insulated hot (1,050°F) and cold (550°F) above-ground tanks to retain solar energy. The thermal storage component allows generation of electricity after dark and during periods of cloud cover, for an average of 8.4 hours per day. To produce electricity, the salt circulates through the receiver and steam generation system where superheated steam is used in a steam turbine generator. Steam turbine exhaust will be condensed in a 20-cell air-cooled condenser.

Based on the summary of structural dimensions in the AFC for RSEP, the hot salt tank was planned with a diameter of 167 feet, wall height of 42 feet, and domed top height of 64.5 feet (SolarReserve 2009). The cold salt tank was planned to be slightly smaller with a diameter of 159 feet and a domed top height of 63.5 feet.

The liquid salt solar generating system for RSEP is proprietary technology of United Technologies Corporation. The technology was successfully used in the 1990s in a 10-MW project located in Barstow, California.

Propane will be used prior to plant start-up in two small boilers for the initial melting, heating, and conditioning of the salt thermal storage medium (Energy Commission 2010a). The salt conditioning process will take place once during plant commissioning, resulting in a closed loop system of liquid salt storage and circulation that will remain heated and contained for the life of the project. RSEP requires no other fossil fuel supply for plant operations.

Crescent Dunes Solar Energy Project (Crescent Dunes SEP)

Crescent Dunes SEP is a 110-MW SPT project with integral thermal storage. SolarReserve is developing Crescent Dunes SEP on approximately 1,600 acres of BLM land near Tonopah, Nevada. Construction began in September 2011 and is expected to be completed in late 2013. Construction was recently completed on the approximately 540-foot SPT for the project. Crescent Dunes SEP is planned for 10 hours of energy storage (Press-Enterprise 2012). Like RSEP, Crescent Dunes SEP will not require a natural gas supply to maintain project operations. **Alternatives Figure 7** shows the completed solar power tower for the Crescent Dunes SEP.

Potential to Attain Project Objectives

Development of an approximately 500-MW SPT project with energy storage at the proposed project site could potentially meet the project objectives related to construction and operation of a utility-scale renewable electrical generation facility, leading to the sale of renewable energy and contributing to achieving California's renewable energy goals; approval of amendments to the PPAs by CPUC could be required. This alternative could potentially satisfy the project objectives addressing the requirement to comply with applicable LORS and avoid or minimize significant impacts to the greatest extent feasible. This alternative would satisfy the project objective to develop a renewable energy facility in an area with high solar value and minimal slope. See the discussions below under, "Environmental Analysis," for analyses of the environmental effects of this alternative compared to the proposed project.

The project objectives include an objective to develop a renewable energy facility capable of providing grid support by offering power generation that is flexible. Adding energy storage capabilities would increase this alternative's operational flexibility to some degree relative to the proposed HHSEGS project.

The proposed project would be located on approximately 3,277 acres, including the 180-acre construction staging and laydown area. To accomplish an approximate electrical capacity of 500 MWs, this alternative could require additional measurable acreage to add energy storage components to the proposed project. The additional acreage would be needed to accommodate the molten-salt storage tanks and additional heliostats that would be required to generate heat for the thermal storage component. The heat stored in the molten salts would be used to generate steam to run the turbines later in the day than would be possible under the proposed project. The project applicant has stated that adding thermal storage requires the addition of at least 18 percent more heliostats to the solar field (Rio Mesa Solar I, II, and III, LLCs 2012).

For BrightSource Energy's two proposed SPT projects without energy storage—HHSEGS and the Rio Mesa SEGF—land use efficiency is approximately 6.6 and 7.6 acres per MW, respectively[5]. (Land use efficiency for the proposed project with the construction laydown area removed from the total project acreage would be approximately 6.2 acres per MW.) Land use efficiency would be reduced under this alternative. In other words, the SPT with Energy Storage Alternative would likely require more acres per MW of capacity. If this alternative was limited to the existing 3,277-acre site, total plant capacity would likely be reduced.

The SPT with Energy Storage Alternative with an increased site boundary could potentially satisfy five or six of the seven project objectives. This alternative would partially satisfy the project objective addressing operational flexibility, and it would go further toward satisfying this project objective compared to the proposed project. Changing the technology and expanding the 3,277-acre project site could result in a project schedule delay, potentially affecting project viability.

[5] The Rio Mesa SEGF project is proposed as a 500-MW facility on approximately 3,805 acres.

Construction of the SPT with Energy Storage Alternative at the proposed project site with no site expansion would probably reduce the total proposed electrical capacity of 500 MWs. Construction and operation of this alternative with no site expansion could potentially satisfy five or six of the seven project objectives, and it would partially satisfy the first project objective to construct and operate a renewable electrical generation facility resulting in sales of competitively priced renewable energy consistent with the needs of California utility companies; however, the total proposed 500-MW capacity would not necessarily be achieved.

Potential Feasibility Issues

Staff submitted data requests for information on the potential feasibility of adding energy storage to the proposed HHSEGS project. In the corresponding data responses, the applicant states that adding energy storage capabilities to the proposed HHSEGS project would be infeasible because of contractual obligations, site limitations, and economics (Hidden Hills Solar I and II, LLCs 2012b). The site limitations discussed by the applicant include the need to redesign the heliostat field and project layout if energy storage was added to the project. The applicant states that the site footprint would have to be expanded. The applicant refers to the signed and approved PPAs, stating that "it would not be feasible to complete the development and engineering of an energy storage system for HHSEGS on a timeline that would allow [the] Applicant to meet its contractual obligations under the PPAs." The applicant states that the addition of energy storage would be extremely costly "and would jeopardize the project's schedule and financial viability."

The power generated by the proposed HHSEGS project would be sold to PG&E under two PPAs approved by CPUC in 2010, which demonstrates that CPUC deems HHSEGS appropriate for helping to meet the state's RPS program goals. As stated above, the applicant has targeted the first or second quarter of 2015 for commercial operation of the proposed project. Staff contacted the CPUC to inquire about the overall process involving CPUC's approval of PPAs for renewable energy projects. CPUC staff stated that filing of amended advice letters requesting amendments to PPAs is not an uncommon occurrence during the 5-year development process for renewable energy projects (Simon, pers. comm., 2012). Once a PPA is approved, submittal of an amended advice letter to CPUC requesting an amended PPA is required unless the change to the project was accounted for in the original PPA for the project (e.g., a PPA that allows a project site change). CPUC's review of requests for amended PPAs considers resultant changes to the pricing structure of the PPA, project viability, and value compared to cost. For example, in considering a hypothetical amendment to a PPA to add energy storage to a solar thermal project, CPUC would assess the net economic benefit of the added storage.

In October 2011, the project applicant filed an AFC with the Energy Commission for development of three 250-MW solar power plants for the Rio Mesa SEGF, which would use the same technology as the proposed HHSEGS project. Since filing the AFC for the Rio Mesa SEGF project, the applicant filed an amended AFC to eliminate one of the three power plants for that project. The planned development schedules for the proposed HHSEGS project and Rio Mesa SEGF overlap with the Sonoran West project

that is being planned under a PPA with SCE. Given the immensity and complexity of these renewable energy projects, and CPUC's strong encouragement of storage for such projects, it is reasonable to conclude that BrightSource Energy management is fully aware of the potential for project changes to affect project scheduling and financing.

Altering the proposed HHSEGS project and expanding the site to include TES would delay the project schedule and increase project costs. It is unknown what other circumstances could affect the potential for site expansion (e.g., site topography, the potential presence of biological or cultural resources, etc.).

The work required to alter the project to include storage would delay the project schedule. It is not known at what point a project schedule delay and increased project costs would affect project viability.

Environmental Analysis

Alternatives Table 4 presents a summary comparison of impacts of the proposed HHSEGS project to the same or similar potential impacts of the SPT with Energy Storage Alternative. Comparative discussions for each environmental topic area follow the table.

Alternatives Table 4
Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative

Environmental Effect	Proposed Project	SPT with Energy Storage Alternative
Air Quality		
Construction-related emissions	SM	Similar to HHSEGS (SM)
Project operations emissions	SM	Similar to HHSEGS (SM)
Biological Resources		
Impacts on special-status plant species	SM	Similar to or somewhat greater than HHSEGS (SM)
Impacts on waters of the U.S. and waters of the state	SM	Similar to or somewhat greater than HHSEGS (SM)
Impacts on desert tortoise	SM	Similar to or somewhat greater than HHSEGS (SM)
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	SM	Similar to or somewhat greater than HHSEGS (SM)
Impacts on avian species from collisions with project	PSU	Similar to or

Alternatives Table 4 Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative		
Environmental Effect	**Proposed Project**	**SPT with Energy Storage Alternative**
features (see biological resources note)		somewhat greater than HHSEGS (PSU)
Impacts on avian species from exposure to concentrated solar flux	PSU	Similar to or somewhat greater than HHSEGS (PSU)
Potential impacts on groundwater dependent ecosystems	PSM	Somewhat greater than HHSEGS (PSM)
Biological resources note: Collisions could be secondary to exposure to concentrated solar flux.		
Cultural Resources		
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see cultural resources note)	LS	Similar to HHSEGS (LS)
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	SU	Similar to HHSEGS (SU)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *on* the site	SM	Similar to HHSEGS (SM)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *beyond* the site	SU	Similar to HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	SU	Similar to HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	SU	Similar to HHSEGS (SU)
Cultural resources note: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site.		
Fire Protection		
Potential impacts on local fire protection resources	PSM	Similar to HHSEGS (PSM)
Potential impacts on emergency response services	PSM	Similar to HHSEGS (PSM)
Geology and Paleontology		
Potential impacts from strong seismic shaking	SM	Same as HHSEGS (SM)

Alternatives Table 4 Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative		
Environmental Effect	**Proposed Project**	**SPT with Energy Storage Alternative**
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	SM	Same as HHSEGS (SM)
Potential impacts on paleontological resources	SM	Same as HHSEGS (SM)
Potential impacts on geological or mineralogical resources	LS	Same as HHSEGS (LS)
Hazardous Materials		
Potential for release of hazardous materials to occur on-site	SM	Similar to HHSEGS (SM)
Potential for release of hazardous materials to occur off-site	SM	Similar to HHSEGS (SM)
Land Use		
Conflicts or inconsistencies with general plan land use designations and zoning	SU	Same as HHSEGS (SU)
Conversion of agricultural land	—	—
Noise and Vibration		
Potential for noise to impact noise-sensitive receptors	PSM	Somewhat greater than HHSEGS (PSM)
Public Health		
Potential for project construction to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Potential for project operations to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Socioeconomic Resources		
Construction employment and increased taxes and fees	B	Similar to HHSEGS (B)
Displacement of existing rural residences	—	—
Potential impacts on emergency medical and law enforcement services	PSM	Similar to HHSEGS (PSM)
Traffic and Transportation		
Potential impacts on roadway infrastructure	SM	Same as HHSEGS (SM)
Potential for glint and glare to cause safety hazards or a distinct visual distraction effect from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	PSM	Same as HHSEGS (PSM)

Alternatives Table 4 Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative		
Environmental Effect	**Proposed Project**	**SPT with Energy Storage Alternative**
Potential for construction equipment and/or permanent structures to exceed 200 feet in height above ground level	SM	Same as HHSEGS (SM)
Transmission Line Safety and Nuisance		
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	SM	Similar to HHSEGS (SM)
Visual Resources		
Construction-Related Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Similar to HHSEGS (SU)
Project Operations Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Same as HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Same as HHSEGS (SU)
Waste Management		
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	SM	Similar to HHSEGS (PSM)
Potential for impacts on human health and the environment related to past or present soil or water contamination	PSM	Similar to HHSEGS (PSM)
Soil and Surface Water		
Soil erosion by wind and water during project construction	SM	Greater than HHSEGS (SM)
Soil erosion by wind and water during project operations	PSM	Somewhat greater than HHSEGS (PSM)
Water quality impacts from contaminated storm water runoff	SM	Somewhat greater than HHSEGS (SM)
Water quality impacts from storm damage	PSM	Similar to HHSEGS (PSM)

Alternatives Table 4 Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative		
Environmental Effect	**Proposed Project**	**SPT with Energy Storage Alternative**
Water quality impacts from power plant operations	SM	Somewhat greater than HHSEGS (SM)
Water quality impacts from sanitary waste	SM	Same as HHSEGS (SM)
Potential impacts from on-site and off-site flooding	SM	Similar to HHSEGS (SM)
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency Management Agency maps	LS	Similar to HHSEGS (LS)
Water Supply		
Potential impacts on local wells	PSM	Somewhat greater than HHSEGS (PSM)
Potential impacts on groundwater basin balance	PSM	Somewhat greater than HHSEGS (PSM)

Air Quality

Staff reviewed the air quality staff assessment of RSEP as a basis to compare the potential air quality effects of this alternative to those of the proposed project. Staff assumes that a project constructed and operated to include molten-salt energy storage would be generally comparable to the proposed HHSEGS project regardless of the specific technology that would be used to facilitate the energy storage.

Under the SPT with Energy Storage Alternative, power plant start-up would require combustion of propane to heat two small boilers for the initial melting, heating, and conditioning of the salt thermal storage medium (Energy Commission 2010a). As discussed above, RSEP requires no other fossil fuel supply for plant operations. The SPT with Energy Storage Alternative would not require other project operations emitting sources during regular plant operations. Net air quality emissions impacts would be **similar to HHSEGS** for this alternative technology. No auxiliary boilers would be required for project operations of this alternative, and much less fuel would be used at the beginning of project operations to liquefy the salt compared to the fuel use that would be required to operate the auxiliary boilers for the proposed project. However, use of the small boilers during power plant start-up could generate air emissions equating to a higher level of emissions than would occur during the initial commissioning phase for a natural gas-fired power plant. The potential for this temporary increase in emissions cannot be quantified, but it could be incrementally greater under this alternative. Mitigation measures similar to those recommended under

the proposed project would reduce impacts to less than significant. Construction-related emissions and impacts would be **similar to HHSEGS** for this alternative.

Incorporating molten-salt storage would require a portion of the area containing the heliostat array to be used to heat the molten salt for energy storage, and thus more land would be required for the same electrical capacity of 250 MWs. This would not cause any significant change in air emissions during project operations. Refer to the discussion below under, “Engineering Assessment of the Alternatives,” for an analysis of power plant efficiency and reliability.

The SPT with Energy Storage Alternative would result in a greater overall cumulative reduction in GHG emissions from power plants compared to the proposed HHSEGS project. This alternative would not worsen current conditions or make a cumulatively considerable contribution to any significant cumulative impact associated with air quality.

Biological Resources

Engineering staff has determined that this alternative technology, compared to the proposed HHSEGS project, would require more land to achieve the same approximate electrical capacity as the proposed project. As discussed above, this alternative would require additional, measurable acreage. (See also the discussion of the SPT with Energy Storage Alternative below under, “Engineering Assessment of the Alternatives.”) The exact size or configuration of a power tower project with added thermal storage is unknown; therefore, comparisons to the proposed HHSEGS project are somewhat speculative. Because recorded locations of special-status plants, animals, and habitats are distributed across the project site and adjacent areas, a reconfigured project could encompass more special-status resources compared to the proposed project. Under this alternative, impacts on special-status plant species would be **similar to or somewhat greater than HHSEGS**.

All surface waters on the project site are ephemeral (flow during storm events) and are presumed to be supported by precipitation (not groundwater) due to their ephemeral hydrology. The washes enter the site from the east and southeast, and trend northwest towards the playa. The channels increase in number and density but decrease in size as they flow down the alluvial fan. Flow volume decreases due to seepage into the unconsolidated sediments of the fan, and transition into unconfined sheet flood areas in the western half of the project site. The size or configuration of a power tower project with added energy storage is unknown and would influence the extent and nature of impacts; for example, an expansion of the project boundary to the east would likely encompass more jurisdictional drainages. Based on staff’s field visit and review of maps showing blue line streams, impacts would likely be **similar to or somewhat greater than HHSEGS** for potential impacts on waters of the U.S. and waters of the state. Under this alternative, conditions of certification would be implemented to reduce potentially significant impacts on waters of the U.S. and waters of the state to less than significant.

With a potentially larger project site, impacts on desert tortoise and other special-status terrestrial species would be **similar to or somewhat greater than HHSEGS**, as impacts on individuals in regional populations are generally directly correlated to a project's size. Under this alternative, conditions of certification could be implemented to reduce potentially significant effects to less than significant.

Water use at solar farms is influenced in part by how many heliostats are installed and how often heliostats are washed. For this analysis, it is assumed that operational water use would be somewhat greater than what is proposed for the HHSEGS project because of the increased number of heliostats that would be required to generate heat for the thermal storage component. The incremental increase in groundwater consumption would result in somewhat greater impacts on groundwater resources and, therefore, also **somewhat greater impacts on local groundwater dependent plants**, and the many unique assemblages of plants and wildlife that they support. For the proposed HHSEGS project, feasible mitigation measures exist to reduce potentially significant groundwater impacts to less than significant. Similar conditions of certification would reduce impacts on groundwater dependent ecosystems to below a level of significance.

Impacts on special-status avian species under this alternative would stem from exposure to concentrated solar flux, collisions with project features, and loss of habitat. A somewhat larger project site with more buildings could pose a greater collision risk. If this alternative incorporated more heliostats, the risk of collision with those structures could increase. The impact of collision with project features on avian species would be **similar to or somewhat greater than HHSEGS**. Similarly, additional heliostats would increase the volume and influence the location of airspace containing concentrated solar flux. Impacts on avian species from exposure to concentrated solar flux would be **similar to or somewhat greater than HHSEGS**.

Cultural Resources

Construction and operation of the SPT with Energy Storage Alternative at the proposed project site would most likely require additional measureable acreage and increased physical ground disturbance on the project site compared to the proposed project. Under this alternative, a **similar degree of visual intrusion** on off-site resources would occur relative to the proposed project because the vertical profile of HHSEGS would remain largely unchanged. A similar degree of physical disturbance of resources at the facility site would occur relative to the proposed project because the portions of the resources on the facility site, which are small relative to the broad scales of the subject landscapes, would be roughly comparable to the disturbance anticipated under the proposed project. The discussion of archaeological resources under, "Comparison to the Proposed Project," (above) for the Sandy Valley Off-site Alternative states that "[n]o significant archaeological deposits are known to be located on the proposed project site." Therefore, the net effect of this alternative on historical resources would most likely be **similar to that of HHSEGS**. Because the extent and location of additional acreage for this alternative is unknown, no more definitive conclusion is possible.

Fire Protection

Enhancement of the SPT technology with several hours of TES would not cause an increase in the need for or level of fire protection services compared to the proposed project. Staff concludes that this alternative would not change fire risk or the potential for impacts on local fire protection resources. This impact would be **similar to the proposed HHSEGS project**. Like the proposed HHSEGS project, staff has determined that impacts on the local fire department would be significant under this alternative due to the predicted increase in emergency response calls during project construction and operation. Mitigation measures would likely require payment of as yet undetermined project-specific fees to the local fire protection service to enable augmentation of resources such as staff, equipment, and facilities. With implementation of appropriate mitigation measures, impacts on local emergency services would be reduced to less than significant.

Geology and Paleontology

The SPT with Energy Storage Alternative would require construction of additional equipment not included in the proposed HHSEGS project. The additional equipment and structures required for this alternative would not cause any new or more severe impacts on geological and paleontological resources; therefore, these impacts would be the **same as HHSEGS**.

As discussed above under the subsection, “Overview,” for this alternative, additional measureable acreage would be required to generate the same electrical capacity of the two 250-MW solar power plants. The construction techniques and methods used for the alternative technology would be similar to the proposed HHSEGS project. The impacts of constructing and operating the additional equipment associated with this alternative would be the **same as HHSEGS**.

Hazardous Materials

Enhancement of the SPT technology with several hours of TES would not cause an increase in potential risks associated with the release of hazardous materials. Staff concludes that this alternative would not change staff’s determination that with implementation of conditions of certification requiring conformance with applicable LORS, no significant impacts would occur off-site related to the potential release of hazardous materials. This impact is **similar to HHSEGS**.

Land Use

Construction and operation of the SPT with Energy Storage Alternative at the proposed project site would be inconsistent with Inyo County’s designated land uses of Open Space and Recreation, and Recreation (OSR and REC, respectively), and zoning for the Charleston View area (Open Space 40-acre minimum – OSR). An amendment to the Inyo County General Plan would be required to ensure consistency of this alternative with the Land Use Element. Land use impacts would be the **same as HHSEGS** for the SPT with Energy Storage Alternative.

Noise and Vibration

Enhancement of the SPT technology with several hours of TES would increase the noise impact mainly due to the project's potential for the extension of operation before and after sunset. For this analysis, staff assumes that the impact would be **somewhat greater than HHSEGS**. Like the proposed project, conditions of certification would be required to ensure that potentially significant noise impacts were reduced to less than significant during project construction and operation.

Public Health

Enhancement of the SPT technology with several hours of TES would extend this alternative's operations beyond the hours of available sunlight. Staff concludes that use of this alternative technology would result in toxic air emissions and health impacts that would be **similar to those identified under the proposed HHSEGS project** for construction and operations emissions. No significant impacts would occur, and no conditions of certification would be required.

Socioeconomic Resources

Under the SPT with Energy Storage Alternative, the beneficial impact through construction employment and increased taxes and fees would be **similar to HHSEGS**. Potential impacts on emergency medical and law enforcement services would be **similar to HHSEGS**. Like the proposed HHSEGS project, this alternative would increase demand for these public services; however, similar mitigation measures would reduce these impacts to less than significant.

Traffic and Transportation

As discussed in the **Traffic and Transportation** section of this staff assessment, SR 160 is located approximately 10 miles east of the proposed project site, and it provides access to the site via the Old Spanish Trail Highway.

Like the proposed project, daily trips under this alternative would have a significant impact on the structural integrity of the Old Spanish Trail Highway in Nevada and California. Use of Old Spanish Trail Highway for heavy construction traffic and hauling of equipment and materials could cause a significant impact on the structural integrity of the road due to the current and predicted future conditions of the roadway pavement. Old Spanish Trail Highway in Inyo County is approximately 22 feet wide. It lacks shoulders and designed drainage, and is not built or designed for the proposed level of construction traffic that would occur under this alternative. This impact would be the **same as HHSEGS**.

Many of the project elements and major facility components that could produce glint and glare effects under this alternative would be the same as those of the proposed HHSEGS project. It is assumed that the potential impact related to glint and glare would be the **same as the proposed HHSEGS project**. Because of the solar tower height, the applicant would be required to notify the FAA of construction pursuant to the Code of Federal Regulations, Title 14, Aeronautics and Space, Part 77. These regulations

require FAA notification for any proposed structure over 200 feet in height AGL regardless of the distance from an airport. This impact would be the same as the proposed project because both projects would require review and approval by the FAA. This impact would be **the same as HHSEGS**.

Transmission Line Safety and Nuisance

Under the SPT with Energy Storage Alternative, staff concludes that use of this alternative technology would require the use of transmission lines of the same voltage and carrying-capacity as is proposed for HHSEGS. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to HHSEGS**.

Visual Resources

Under the SPT with Energy Storage Alternative, the addition of structures for energy storage, while substantial in size, would be lower in height than the air-cooled condenser and auxiliary boiler stack, which are 120 and 135 feet tall, respectively. As discussed above under, “Rice Solar Energy Project (RSEP),” the summary of structural dimensions lists the domed top heights of the above-ground salt tanks as 64.5 feet and 63.5 feet (SolarReserve 2009). Like the proposed HHSEGS project, implementation of conditions of certification would reduce potential impacts on visual resources for views at the ground plane. Potential impacts of structural lighting could be partially mitigated with implementation of standard conditions of certification to control lighting and screen views. No feasible mitigation measures would reduce the visual impacts of the SPTs, brightness of the SRSGs, and potential visual effects of FAA night safety lighting. Similar to the proposed HHSEGS project, these impacts would remain significant and unavoidable. The potential visual effects of the SPT with Energy Storage Alternative would be **similar to HHSEGS** for construction-related impacts and the **same as the proposed HHSEGS project** for project operations impacts.

This alternative would not worsen impacts of the proposed project nor make a cumulatively considerable contribution to any significant cumulative impact associated with visual resources.

Waste Management

The location of the SPT with Energy Storage Alternative would be the same as the proposed project, and it would be no closer to any unidentified recognized environmental conditions. Similar to the proposed project, staff would require investigation and remediation of soil and groundwater contamination if it was encountered during construction and operation of this alternative. Site characterization and remediation requirements would remain the same as for the proposed project.

The SPT with Energy Storage Alternative would require additional measureable acreage to provide the same energy generation capacity. Construction of additional facilities and equipment installation would be required. Staff anticipates this would also increase the volume of the waste stream by some amount. Although the waste volume would increase somewhat, there is adequate available Class III landfill capacity in

Nevada landfills. Similar to the proposed project, staff considers project compliance with LORS and staff's condition of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the SPT with Energy Storage Alternative. Potential impacts on existing waste disposal facilities and human health and the environment would be **similar to HHSEGS**.

Soil and Surface Water

Staff assumes that the energy capacity of the SPT with Energy Storage Alternative would be similar to the 500-MW capacity of the proposed project, with the ability to also produce power for extended amounts of time (i.e., during cloudy days, beyond the hours of available sunlight). This alternative would require additional measurable acreage. However, the amount of additional land needed is difficult to estimate, because energy storage introduces several sizing options for balancing the size of the thermal storage tank(s) with the required number of additional heliostats.

Depending on the amount of additional land needed, the impacts could range from **somewhat greater up to much greater than the proposed HHSEGS project**. Although a larger solar field is needed for this alternative, installation of the supports for the heliostats does not require significant grading of the heliostat array fields. Assuming additional dirt roads would be created throughout the larger area for access and maintenance of the heliostats, and the footprint for each solar plant would increase to accommodate additional facilities for energy storage, impacts related to soil erosion during construction would be **greater than the proposed HHSEGS project**. Impacts related to soil erosion during project operations would be **somewhat greater than HHSEGS** because of vehicle travel on the dirt roads to clean the additional heliostats.

The additional facilities required for thermal storage could slightly increase the impacts of process wastewater and contamination of storm water runoff; therefore, these impacts are **somewhat greater than HHSEGS**. A septic system for proper disposal of domestic sanitary waste would not change, so these impacts would be the **same as HHSEGS**.

Because of the HHSEGS fixed borders to the east (Nevada state line) and to the south (Old Spanish Trail Highway), it is assumed that the additional acres needed for an energy storage alternative would be obtained by extending the western border of the project site. This larger footprint would extend further into the 100-year flood flows (as shown on FEMA maps). Because of the low impact flow-through layout of the heliostat supports, impacts from 100-year flood flows are **similar to the proposed HHSEGS project** as well as the potential for on-site/off-site flooding or storm damage.

Water Supply

As discussed above, engineering staff has determined that this alternative technology, compared to the proposed HHSEGS project, would require more land to produce the same electrical output. For this discussion, staff assumes that adding energy storage components to the project would require additional, measurable acreage.

Water use at solar farms is influenced in part by how many heliostats are installed, and how often heliostats are washed. Adding thermal storage would require the addition of at least 18 percent more heliostats to the solar field (Rio Mesa Solar I, II, and III, LLCs 2012). Staff assumes water use would also likely be somewhat greater than currently proposed at the HHSEGS site in order to service longer hours of operation. Increased groundwater consumption would result in somewhat greater impacts on groundwater resources. Staff lacks specific information on a potential footprint for this alternative and the exact water needs of a project with energy storage. Staff assumes the level of impacts on water supply could increase proportionally with increased water usage. Impacts related to groundwater depletion would be **somewhat greater than HHSEGS** for the SPT with Energy Storage Alternative. The same conditions of certification proposed by staff for the proposed HHSEGS project would be recommended for this alternative. With implementation of conditions of certification, potential impacts on water supply and groundwater resources would be reduced to less than significant.

SOLAR PHOTOVOLTAIC (PV) ALTERNATIVE

Overview

This alternative would involve constructing and operating a utility-scale PV project at the proposed project site. Solar PV technology involves the direct conversion of photons (i.e., sunlight) into electricity. PV modules (also called solar panels) absorb solar radiation and convert it into direct current electricity (Hidden Hills Solar I and II, LLCs 2011a). This direct current power is then converted into alternating current electricity for delivery to the electrical grid system. This conversion occurs when direct current (DC) flows through a device called an *inverter*, which converts the electrical characteristics to alternating current (AC) that can be tied to the power distribution system for power delivery. The electrical current produced is directly dependent on how much light strikes the module. Multiple PV panels are wired together to form an array, an arrangement that increases the total system output. PV technology does not involve thermal energy or the production of steam to power turbines. PV systems are relatively simple to operate and maintain and require little water for project operations compared to solar thermal energy systems.

A traditional fixed-tilt PV system is composed of flat-plate collectors (i.e., PV solar panels or modules) installed in arrays at a fixed tilt facing south. Maximum yearly solar radiation can be achieved using a tilt angle approximately equal to a site's latitude. Larger, more complex installations use tracking flat-plate collectors that tilt the panels toward the sun for maximum efficiency. PV trackers use either single-axis (east-west) tracking or dual-axis (east-west and north-south) tracking in order to maximize the panels' absorption of sunlight during the day and throughout the year (Hidden Hills Solar I and II, LLCs 2011a). Tracking PV modules produce more electricity annually compared to fixed-tilt modules. **Alternatives Figure 8** includes photographs showing fixed-tilt and tracking PV modules.

Staff requested additional information to compare the proposed HHSEGS project to an alternative using PV technology. In its responses, the applicant questions "whether a PV project could be developed that would generate a net 500 MWs and be capable of

selling competitively priced renewable energy, consistent with the procurement obligations of California's publicly owned and privately owned utilities" (Hidden Hills Solar I and II, LLCs 2012b). Examples of PV projects provided by the applicant include a 21-MW project on 200 acres in Blythe and a 48-MW project on 350 acres in Boulder City, Nevada (Copper Mountain Solar 1) that was completed in late 2010. (Conflicting online news sources report the total capacity of Copper Mountain Solar 1 as either 48 MWs or 58 MWs.) **Alternatives Figure 8** includes a photograph of the Copper Mountain Solar 1 project. Expansion of the Copper Mountain PV complex is underway; when construction of Copper Mountain Solar 2 is completed, it will include an additional 150 MWs of generating capacity (Sempra U.S. Gas & Power 2012). Based on staff's review of various online news sources, at least four utility-scale PV projects are approved and in development in California, including the Topaz Solar Farm Project (further described below); **Alternatives Table 5** summarizes the four approved projects. Based on data in the final, approved environmental documents for these PV projects, average land use efficiency is approximately 7 acres per MW. Based on a total acreage of approximately 3,277 acres, land use efficiency is approximately 6.6 acres per MW for the proposed project and 7.6 acres per MW for the proposed Rio Mesa SEGF project.

The Draft Solar Programmatic Environmental Impact Statement (Draft Solar PEIS) prepared by BLM in 2010 summarizes "utility-scale PV facilities" that were scheduled for completion in several countries in 2008 and beyond. Many of these facilities had capacities (expressed as megawatt peak [MWp]) in the range of 10–25 MWp (BLM 2010). The Draft Solar PEIS listed average land use efficiency for PV facilities as 9 acres per MW (BLM 2010). The largest of the PV facilities listed in Table F.3.2-2 of the Draft Solar PEIS is the 550-MW Topaz Solar Farm Project (see below), and the total plant acreage is shown as 6,200 acres. When San Luis Obispo County approved the Topaz Solar Farm Project in March 2011, the selected alternative reduced the facility's fence line to encompass approximately 3,500 acres (see **Alternatives Table 5**). The project was reconfigured to reduce impacts on biological resources and avoid Williamson Act lands, and the 550-MW generating capacity was maintained.

The April 2012 DRECP Stakeholder Committee Meeting included a review of an update to the renewable energy calculator that was developed by Energy Commission staff to use as a tool for framing an understanding of renewable energy supply and demand for the 2040 planning horizon. Partly in response to comments on an earlier version of the 2040 planning scenario, the acreage requirement for all central station solar projects, including solar thermal and PV project types, was reduced from 9.1 acres per MW to 7 acres per MW. Although it was acknowledged at the meeting that scenarios will vary depending partly on the portfolio[6], the modified efficiency ratio is considered to be plausible and reasonable. Adjustments to the portfolio will be made every 5 years during the planning horizon. Of the four PV projects summarized by staff in **Alternatives Table 5**, the two 550-MW projects show land use efficiencies that are slightly below 7 acres per MW. (The proposed HHSEGS and Rio Mesa SEGF projects are also close to that

[6] The portfolio includes central station solar thermal, central station PV, wind, biomass/fuels, geothermal, utility-side distributed generation, and small rooftop solar.

land use efficiency ratio). For this alternatives analysis, staff assumes that the Solar PV Alternative could be implemented at the proposed project site with no site expansion.

Site disturbance or grading for the PV projects shown in **Alternatives Table 5** is generally described in the environmental review documents for the projects. For the California Valley Solar Ranch Project, the final EIR states that "[l]imited grading is expected to be required because of the relatively flat terrain and because the arms of the solar arrays would be adjustable and would therefore not need to be located on completely leveled ground" (San Luis Obispo County 2011a). The siting criteria for the California Valley Solar Ranch Project includes a criterion to deploy the project in a "minimally invasive manner, including minimal landform alteration (low or no grading) to minimize impacts to biology, ecology, and air quality, among other resources." The final EIS for the Desert Sunlight Solar Farm Project describes site preparation techniques to reduce the required volume of earth movement. A process of *micrograding* or *isolated cut and fill and roll* is described to trim off high spots and use the material to fill in low spots for areas that make up more than half of the solar field; standard cut and fill techniques are intended for use in specific arrays to limit slope to within 3 percent (BLM 2011). It is stated in the final EIS for the Topaz Solar Farm Project that "[g]rading would not be required under most PV arrays" (San Luis Obispo County 2011b).

Operational water use for the PV projects shown in **Alternatives Table 5** varies from less than 0.3 acre-feet per year (afy) for the Desert Sunlight Solar Farm Project to approximately 12 afy for the AV Solar Ranch One Project. The proposed HHSEGS project would require approximately 140 afy for project operations.

Alternatives Table 5
Summary Descriptions of Four Approved Utility-Scale Solar Photovoltaic Projects in California

Project Name and Location	PV Technology	Capacity, Land Use Efficiency, and Energy Production	Schedule
AV Solar Ranch One Project, Antelope Valley area of northern Los Angeles County	First Solar thin-film PV technology with cadmium telluride (CdTe) as the semiconductor material enclosed in two sheets of glass; of the total 230 MWs, 52 MWs are horizontal trackers and 178 MWs are fixed-tilt panels; about 3 million panels total	230 MWs; total of 1,955 acres will be subject to direct ground disturbance; about 8.5 acres per MW; 592 gigawatt hours per year (GWh/yr)	Project approved December 2010;will be fully operational at the end of 2013

Alternatives Table 5
Summary Descriptions of Four Approved Utility-Scale Solar Photovoltaic Projects in California

Project Name and Location	PV Technology	Capacity, Land Use Efficiency, and Energy Production	Schedule
Desert Sunlight Solar Farm Project, Chuckwalla Valley of the Sonoran Desert in eastern Riverside County	First Solar thin-film PV technology with CdTe as the semiconductor material; all fixed-tilt panels; about 9 million panels total	550 MWs; total of 3,761 acres, as stated in the Record of Decision; about 6.9 acres per MW; 1,190 GWh/yr	Project approved August 2011 and will be fully operational by the first quarter of 2015
Topaz Solar Farm Project, Carrizo Plain, eastern San Luis Obispo County	First Solar thin-film PV technology with CdTe as the semiconductor material enclosed in two sheets of glass; all fixed-tilt panels; about 9 million panels total	550 MWs; total of 3,500 acres; about 6.4 acres per MW; 1,096 GWh/yr	Project approved summer 2011; construction began in late 2011 and will be finished in 2015
California Valley Solar Ranch Project, northeastern edge of the Carrizo Plain in southeastern San Luis Obispo County	Crystalline silicon PV panels attached to the SunPower T0 Tracker® system (1,032 tracker units in ten arrays); single-axis tracking; about 757,320 panels	250 MWs; total of 1,500 acres; about 6 acres per MW; 688 GWh/yr	Project approved April 2011 and will be fully operational by 2013

Sources:
AV Solar Ranch One Project: <http://planning.lacounty.gov/case/view/project_no._r2009-02239_tract_map_no._tr071035_av_solar_ranch_one_project>
Desert Sunlight Solar Farm Project: <http://www.blm.gov/ca/st/en/fo/palmsprings/Solar_Projects/Desert_Sunlight.html>
Topaz Solar Farm Project: <http://www.slocounty.ca.gov/planning/environmental/EnvironmentalNotices/optisolar.htm>
California Valley Solar Ranch Project: <http://www.slocounty.ca.gov/planning/environmental/EnvironmentalNotices/sunpower.htm>
(Bernheimer and Ekstrom, pers. comms., 2012)

Potential to Attain Project Objectives

Recent approvals and ongoing construction of utility-scale PV projects in California and Nevada indicates the suitability of using PV technology for development of a large, renewable energy power plant with a capacity of several hundred MWs. Development of an approximately 500-MW solar PV project at the proposed project site could potentially meet the project objectives related to construction and operation of a utility-scale renewable electrical generation facility, which would lead to the sale of renewable energy and contribute to achieving California's renewable energy goals. It is unknown whether approval of amendments to the PPAs by CPUC would be required. This

alternative could potentially satisfy the project objectives addressing the requirement to comply with applicable LORS and avoid or minimize significant impacts to the greatest extent feasible. This alternative would satisfy the project objective to develop a renewable energy facility in an area with high solar value and minimal slope. See the discussions below under, "Environmental Analysis," for general analyses of the potential environmental effects of this alternative.

The Solar PV Alternative could potentially satisfy five or six of the seven project objectives. This alternative would not satisfy the project objective addressing operational flexibility. It is not known whether the proposed 3,277-acre project site could be used for construction of a PV project that would achieve close to the 500-MW capacity of the proposed project. Although based on staff's review of the four utility-scale PV projects discussed above, land use efficiencies of less than 7 acres per MW are being achieved at other sites in the state. Because this alternative would use the proposed project site, the objective to obtain site control and use within a reasonable period of time would be attained.

Potential Feasibility Issues

The applicant's data responses on the feasibility of a PV alternative describe how this alternative would not comply with provisions of the PPAs for the proposed project. The applicant states that "[f]ailure to satisfy this contractual obligation means that such an alternative is infeasible taking into account economic factors and it could not be accomplished successfully in a reasonable time period, given the long-lead time for the utility [request for offer] process and CPUC contract approval" (Hidden Hills Solar I and II, LLCs 2012b). The applicant states that this alternative may be infeasible because "it could not be accomplished in a reasonable time frame, given the lead time to negotiate for the use of another proprietary technology and the follow-on development process."

The work required to redesign the project to use a PV technology would delay the project schedule, and it is not known at what point a project schedule delay would affect project viability.

Environmental Analysis

Alternatives Table 6 presents a summary comparison of impacts of the proposed HHSEGS project to the same or similar potential impacts of the Solar PV Alternative. Comparative discussions for each environmental topic area follow the table.

Alternatives Table 6
Summary Comparison of the Proposed Project's Impacts to the Solar Photovoltaic Alternative

Environmental Effect	Proposed Project	Solar PV Alternative
Air Quality		
Construction-related emissions	SM	Similar to HHSEGS (SM)

Alternatives Table 6 Summary Comparison of the Proposed Project's Impacts to the Solar Photovoltaic Alternative		
Environmental Effect	**Proposed Project**	**Solar PV Alternative**
Project operations emissions	SM	Less than HHSEGS (SM)
Biological Resources		
Impacts on special-status plant species	SM	Same as HHSEGS (SM)
Impacts on waters of the U.S. and waters of the state	SM	Same as HHSEGS (SM)
Impacts on desert tortoise	SM	Same as HHSEGS (SM)
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	SM	Same as HHSEGS (SM)
Impacts on avian species from collisions with project features	PSU	Unknown (PSU)
Impacts on avian species from exposure to concentrated solar flux	PSU	—
Potential impacts on groundwater dependent ecosystems	PSM	Somewhat less than HHSEGS (PSM)
Cultural Resources		
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see cultural resources note)	LS	Similar to HHSEGS (LS)
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	SU	Much less than HHSEGS (PSM)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *on* the site	SM	Similar to HHSEGS (SM)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *beyond* the site	SU	Much less than HHSEGS (PSM)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	SU	Similar to HHSEGS (PSU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	SU	Somewhat less than HHSEGS (PSU)
Cultural resources note: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site.		
Fire Protection		
Potential impacts on local fire protection resources	PSM	Less than HHSEGS (PSM)
Potential impacts on emergency response services	PSM	Less than HHSEGS (PSM)

Alternatives Table 6 Summary Comparison of the Proposed Project's Impacts to the Solar Photovoltaic Alternative		
Environmental Effect	**Proposed Project**	**Solar PV Alternative**
Geology and Paleontology		
Potential impacts from strong seismic shaking	SM	Much less than HHSEGS (PSM)
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	SM	Much less than HHSEGS (PSM)
Potential impacts on paleontological resources	SM	Less than HHSEGS (PSM)
Potential impacts on geological or mineralogical resources	LS	Same as HHSEGS (LS)
Hazardous Materials		
Potential for release of hazardous materials to occur on-site	SM	Similar to HHSEGS (SM)
Potential for release of hazardous materials to occur off-site	SM	Similar to HHSEGS (SM)
Land Use		
Conflicts or inconsistencies with general plan land use designations and zoning	SU	Same as HHSEGS (SU)
Conversion of agricultural land	—	—
Noise and Vibration		
Potential for noise to impact noise-sensitive receptors	PSM	Much less than HHSEGS (PSM)
Public Health		
Potential for project construction to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Potential for project operations to cause air toxics-related impacts that could affect public health	LS	Less than HHSEGS (LS)
Socioeconomic Resources		
Construction employment and increased taxes and fees	B	Similar to HHSEGS (B)
Displacement of existing rural residences	—	—
Potential impacts on emergency medical and law enforcement services	PSM	Similar to HHSEGS (PSM)
Traffic and Transportation		
Potential impacts on roadway infrastructure	SM	Same as HHSEGS (SM)
Potential for glint and glare to cause safety hazards or a distinct visual distraction effect from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	PSM	Much less than HHSEGS (LS)
Potential for construction equipment and/or permanent	SM	—

Alternatives Table 6 Summary Comparison of the Proposed Project's Impacts to the Solar Photovoltaic Alternative		
Environmental Effect	**Proposed Project**	**Solar PV Alternative**
structures to exceed 200 feet in height above ground level		
Transmission Line Safety and Nuisance		
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	SM	Similar to HHSEGS (SM)
Visual Resources		
Construction-Related Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Less than HHSEGS (SM)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Less than HHSEGS (SM)
Project Operations Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Much less than HHSEGS (PSM)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Much less than HHSEGS (PSM)
Waste Management		
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	SM	Similar to HHSEGS (PSM)
Potential for impacts on human health and the environment related to past or present soil or water contamination	PSM	Somewhat greater than HHSEGS (PSM)
Soil and Surface Water		
Soil erosion by wind and water during project construction	SM	Somewhat less than HHSEGS (SM)
Soil erosion by wind and water during project operations	PSM	Less than HHSEGS (PSM)
Water quality impacts from contaminated storm water runoff	SM	Much less than HHSEGS (LS)
Water quality impacts from storm damage	PSM	Somewhat greater than HHSEGS (PSM)
Water quality impacts from power plant operations	SM	Much less than HHSEGS (LS)

Alternatives Table 6 Summary Comparison of the Proposed Project's Impacts to the Solar Photovoltaic Alternative		
Environmental Effect	**Proposed Project**	**Solar PV Alternative**
Water quality impacts from sanitary waste	SM	Similar to HHSEGS (SM)
Potential impacts from on-site and off-site flooding	SM	Similar to HHSEGS (SM)
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency Management Agency maps	LS	Similar to HHSEGS (LS)
Water Supply		
Potential impacts on local wells	PSM	Somewhat less than HHSEGS (PSM)
Potential impacts on groundwater basin balance	PSM	Somewhat less than HHSEGS (PSM)

Air Quality

The number of permitted fuel-consuming and air pollutant emitting sources would be significantly fewer under the Solar Photovoltaic Alternative. This alternative would not be subject to Energy Commission jurisdiction and would be permitted locally, including the air permits from the air district. Construction-related emissions and impacts would be **similar to HHSEGS** for this alternative. Staff reviewed the air quality analyses for the four approved utility-scale PV projects summarized above under the subsection, "Overview." Operational impacts related to criteria pollutant emissions for those projects were described to include normal maintenance truck activity, periodic fire water pump engine testing, and use of water trucks coinciding with the infrequent work to wash the PV modules. Operational emissions are described as "limited" or "minimal." Of the four reviewed PV projects, two required preparation and implementation of an operational dust control plan. Use of fossil fuel-fired energy generation is not required under this alternative.

Impacts on air quality from operation of the Solar Photovoltaic Alternative would be **less than HHSEGS**. This alternative would result in a greater overall cumulative reduction in GHG emissions from power plants compared to the proposed HHSEGS project. The Solar Photovoltaic Alternative would not worsen current conditions or make a cumulatively considerable contribution to any significant cumulative impact associated with air quality.

Biological Resources

Solar PV technology employs either fixed-tilt or tracking solar panels to collect incident radiation. Between these two options, slight differences in potential impacts are identified related to the amount of site grading and preparation that could be required. This discussion of potential impacts on biological resources from the Solar PV

Alternative presents a general analysis of PV solar collectors without choosing a particular type of technology. It is assumed that the Solar PV Alternative would use a low-impact design that would minimize on-site grading and manage remaining native vegetation under the solar panels by mowing. It is possible that no grading would be necessary under most of the solar panels for the Solar PV Alternative. Assuming the same project boundary under this alternative, impacts on special-status plant species, waters of the state, and waters of the U.S., would be the **same as HHSEGS**.

The PV Alternative would remove habitat occupied by desert tortoise and other special-status terrestrial wildlife species; this alternative would cause other direct and indirect impacts such as weed proliferation and increased dust. These impacts would be the **same as HHSEGS**.

Impacts on avian species would occur through conversion of the project site from native habitat to a solar farm and potential collisions with project features such as PV panels and transmission lines. This technology does not require central collector towers (e.g., an SPT at the center of a heliostat array) or concentrate solar energy over a heliostat field; therefore, **no impacts** on avian species would occur from exposure to solar flux. The Solar PV Alternative would cause **no impact** on avian species from exposure to solar flux.

Little research-based data is available to determine the extent of collision impacts on avian species from either the photovoltaic or solar power tower technologies. Similar to concentrating solar power technology, the PV Alternative would have the potential to cause a “mirage” effect from the appearance of the sky reflected off the solar panels when viewed from a distance (see **Alternatives Figure 8**). Properties of the smooth, glass surfaces of the PV panels are known to cause polarized light pollution (Horváth et al. 2009 and 2010). The final EIS for the Topaz Solar Farm Project (San Luis Obispo County 2011b) identified solar modules, or panels, as posing a possible risk of collision for birds, including golden eagle. The analysis discussed the possibility of birds colliding with the PV panels depending on the potential effects of “glare or polarized light” from the panels. Both of these potential effects (i.e., the mirage effect or the effects of polarized light) could attract birds or bats to the facility, where they could be susceptible to mortality or injury by collision.

While little data is available addressing how reflectivity of different solar collector surfaces may influence avian collisions, a 2009 technical memorandum on a review of potential impacts of solar array developments on biological resources states that “non-reflective flat plate panels are preferred over reflective technologies, such as CSP, for sites with burrowing owls. It is recommended that the impact of solar panel reflective properties be part of the procurement selection criteria to minimize impacts on avian wildlife” (City of San Jose 2009). Burrowing owl are present at the proposed project site, and although the owls would be evicted from the site during construction, owls could potentially reenter the site during or following construction. Impacts on burrowing owl from installation of solar panels under this alternative would cause similar effects on other bird species and not be limited to burrowing owl. The 2009 technical memorandum does not address the potential effects of polarized light from PV panels.

The extent and severity of potential collision impacts on avian species under the Solar PV Alternative is unquantifiable and cannot be reasonably compared to the proposed project. Impacts on avian species from collisions with solar panels and other structures are **unknown compared to HHSEGS**. Impacts on avian species stemming from habitat loss could be mitigated to below a level of significance. However, no evidence exists demonstrating that impacts related to collisions with project structures could be reduced to below a level of significance, and these impacts could remain significant and unavoidable.

Photovoltaic solar plants require less operational water use, and less groundwater pumping, compared to the proposed project. Therefore, potential impacts on groundwater dependent plants and wildlife species would be **somewhat less than HHSEGS**.

Cultural Resources

Construction and operation of the Solar PV Alternative at the proposed project site would require roughly the same extent of physical ground disturbance on the project site. The extent of the visual intrusion on off-site resources relative to the proposed project would be **much less than HHSEGS**, while the extent of physical disturbance of resources at the facility site relative to the proposed project would be **similar to that of HHSEGS**.

The overall scale of this alternative and the vertical profile would be substantially reduced with elimination of the proposed project's power towers. Compared to the solar power towers and heliostats for the proposed project, the PV structures would not be visible from some portions of the broad, landscape-scale resources that are the subjects of concern; and where the terrain would allow views of portions of the PV arrays, the level of the visual intrusion in the landscape would be much less than HHSEGS. In addition to the dramatically reduced vertical scale of the Solar PV Alternative, the much less reflective surfaces of the PV modules would be less intrusive compared to the mirrored heliostats. The overall physical disturbance of the portions of the resources on the facility site, although small relative to the broad scales of the subject landscapes, would nonetheless be roughly comparable to the site disturbance that would occur under the proposed project. Staff characterizes the net effect of this alternative on historical resources as **much less than HHSEGS**. Of the impacts identified by cultural resources staff, two impacts addressing archaeological and built-environment resources *beyond* the site that are considered "significant and unavoidable" under the proposed project would be reduced to "potentially significant" under this alternative (see **Alternatives Table 6**). These two impacts could be reduced to less than significant with implementation of appropriate compensatory mitigation measures.

Impacts addressing two ethnographic resources *on* and *beyond* the site that are considered "significant" under the proposed project are considered "potentially significant" under this alternative. These two impacts are considered, **similar to HHSEGS**, and, **somewhat less than HHSEGS**, respectively. Because no feasible means of compensation are available to reduce these impacts on aboriginal ancestral

territory, staff concludes that these two impacts would remain significant and unavoidable under the Solar PV Alternative.

Fire Protection

The Solar PV Alternative would use photovoltaic cells to convert solar radiation directly into electrical current. This alternative would pose reduced fire risks and impacts on local fire protection resources compared to those associated with the proposed project, and the corresponding mitigation measures needed by the authority having jurisdiction for emergency response would also be reduced. This impact would be **less than the proposed HHSEGS project**. Compared to the SPT technology of the proposed HHSEGS project, staff expects that this alternative could require smaller work crews during construction and operation. This alternative would require far less flammable and hazardous materials use. Due to the simpler construction and operational requirements and the less complex equipment set associated with the PV technology, the potential for this alternative to place significant extra demands on local emergency response services (due to the predicted fewer worker accidents, fires, and hazardous materials spills) would be **less than the proposed HHSEGS project**. Staff concludes that impacts would be potentially significant; mitigation measures would likely require payment of as yet undetermined project-specific fees to the local fire protection service determined to be necessary to enable augmentation of resources such as staff, equipment, and facilities. With implementation of appropriate mitigation measures, impacts on local emergency services would be reduced to less than significant.

Geology and Paleontology

Construction and operation of the Solar PV Alternative at the proposed project site could have fewer impacts compared to the proposed HHSEGS project. Primarily, the Solar PV Alternative would not require the deep or otherwise specialized foundations that would be required for the SPTs and the numerous heliostat foundations of the proposed project. The elimination of deep foundations would decrease the potential for encountering fossil-bearing strata, and due to elimination of tall tower structures, this alternative as a whole would be much less susceptible to the effects of strong seismic shaking. Depending on the type of embedded foundation that would support tracker or fixed-tilt PV units (e.g., drilled concrete piers, driven piers, or screw-type foundations), the potential impact on fossil-bearing strata could be somewhat less than or similar to the proposed project. The net effect of this alternative on geological and paleontological resources would be **less than HHSEGS**.

Hazardous Materials

The Solar PV Alternative would use photovoltaic cells to create electrical power at the proposed HHSEGS site instead of the proposed SPT project. This alternative would pose no potential for new or more severe off-site impacts from required use of hazardous materials at the site. Thus, this alternative would be similar to the proposed project regarding the potential risk for an accidental release of hazardous materials to occur at the site. This impact would be **similar to HHSEGS**.

Land Use

Construction and operation of the Solar PV Alternative at the proposed project site would be inconsistent with Inyo County's designated land uses (OSR and REC) and zoning for the Charleston View area (OS-40). An amendment to the Inyo County General Plan would be required to ensure consistency of this alternative with the Land Use Element. Land use impacts would be the **same as HHSEGS** for the Solar Photovoltaic Alternative.

Noise and Vibration

Photovoltaic cells convert solar radiation directly into electrical current. No mechanical equipment (which is the major source of noise) is used for this technology. The only source of noise would be the inverters, which are generally quiet at relatively short distances. Impacts related to noise would be **much less than HHSEGS** under this alternative. Depending on the location of sensitive noise receptors relative to the inverters, conditions of certification could be required to reduce potentially significant impacts to less than significant.

Public Health

The Solar PV Alternative would not cause minor combustion-related boiler emissions. Based on staff's review of the operational water use for the four PV projects described above, washing of the PV panels under this alternative could be necessary once or twice per year. Staff assumes that infrequent washings of the panels could include the use of diesel-fueled water trucks, which would cause some toxic air emissions (i.e., diesel particulate matter). Due to the infrequent washings of PV panels, toxic air emissions under this alternative from the use of diesel-fueled vehicles could be substantially less compared to the proposed project. Some high-performance solar PV cells are known to contain small amounts of cadmium, selenium, and arsenic, and these substances could be emitted if any solar cells were broken. However, staff does not consider any such emission hazards to be significant because under normal project operations, the PV panels would remain intact. Staff thus considers potential public health risks from this alternative technology to be **less than the proposed HHSEGS project** for project operations emissions. For project construction emissions, the impact on public health would be **similar to HHSEGS**.

Socioeconomic Resources

Under the Solar PV Alternative, the beneficial impact through construction employment and increased taxes and fees would be **similar to HHSEGS**. Potential impacts on emergency medical and law enforcement services would be **similar to HHSEGS**. Like the proposed HHSEGS project, this alternative would increase demand for these public services; however, similar mitigation measures would reduce these impacts to less than significant.

Traffic and Transportation

Similar to the proposed project, the Solar PV Alternative would require use of SR 160 and the Old Spanish Trail Highway for hauling of equipment and materials to the project

site, which could cause a significant impact on the structural integrity of the road due to the current and predicted future conditions of the roadway pavement. This impact would be the **same as HHSEGS**.

Because solar PV panels absorb sunlight, impacts related to glint and glare would be **much less than HHSEGS**. The Solar PV Alternative would not have the potential to cause safety hazards from an operator control perspective (i.e., vehicle drivers and aircraft pilots). See the discussion below under the subsection, "Visual Resources," for an analysis of glint and glare impacts for the Solar PV Alternative.

Staff reviewed the traffic and transportation analyses for the four approved utility-scale PV projects summarized above under the subsection, "Overview." No construction equipment or permanent structures were identified for those projects that would be taller than the projects' transmission lines, which are less than 200 feet tall. As discussed in the **Traffic and Transportation** section of this staff assessment, McCarran International Airport in Las Vegas, Nevada, is approximately 45 miles east of the proposed HHSEGS site. The proposed Pahrump Valley General Aviation airport would be approximately 10 miles northwest of the proposed project site. No structures associated with the proposed project would penetrate the navigable airspace of these airports. The Department of Defense determined that the proposed project would cause no military mission impacts. Under the Solar PV Alternative, no structures would necessarily require review and approval by FAA, and **no impact** would occur under the Solar PV Alternative.

Transmission Line Safety and Nuisance

Under the Solar PV Alternative, photovoltaic cells would be used at the proposed HHSEGS site instead of the proposed technology. (The proposed project would result in minor combustion-related boiler emissions.) Since this alternative would be located at the proposed HHSEGS site, staff expects the utilized transmission lines and related impacts to be similar, conferring no benefit regarding the field and nonfield impacts of concern in staff's **Transmission Line Safety and Nuisance** testimony in this staff assessment. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to HHSEGS**.

Visual Resources

Comparison of the Proposed HHSEGS Project to the Solar PV Alternative

The Solar PV Alternative would not use heliostats or any other type of mirrored-surface solar collector. Although the acreage requirement for this alternative would not change compared to the proposed HHSEGS project, the most notable difference between the proposed project and the Solar PV Alternative is the lack of the visually dominant power towers, brightly glowing SRSGs, and FAA safety lighting. The Solar PV Alternative would not use boilers, turbines, steam, and cooling equipment. The number and complexity of structures associated with this alternative would be reduced compared to the proposed HHSEGS project. Elimination of the 135-foot air-cooled condenser and 120-foot stack and other structures from the base of the power tower would potentially lower the profile of the Solar PV Alternative to that of 2–3 story buildings.

Although a potential configuration for this alternative is unknown, the PV arrays could resemble those of the 550-MW Topaz Solar Farm Project that is under construction in eastern San Luis Obispo County. The PV solar modules for that project are being installed in approximately 460 arrays (San Luis Obispo County 2011b). Each array will consist of up to approximately 20,000 modules. The fixed-tilt PV modules will be mounted on steel support structures called tables, each holding about 16 modules. Once mounted, the front of each table will be about 1½ feet above grade and the rear will be about 5½ feet above grade. The total distance from the ground to the top of the PV module table may vary depending on the topography. (The above-grade maximum module height for a tracking PV system would be a few feet higher.) Each array will require approximately 7 acres and be equipped with a power conversion station, including two inverters and one transformer. For the Topaz Solar Farm Project, drawings showing a typical array configuration show modules grouped in rows that are approximately 240 feet long. This general layout will be repeated to cover the site uniformly. Permanent building heights will not exceed 30 feet and on-site electrical collection system poles will not exceed 43 feet, except within one-half mile of the project substation, where the pole height will not exceed 52 feet.

The visual simulations of PV solar arrays in Section C.2, “Aesthetics,” in the final EIR for the Topaz Solar Farm Project depict a near-continuous surface area covering visible portions of the project site. The PV modules would likely cast shadows on the ground. The collector side of the panels is variably seen as dark to lighter in color. The visual effect of what appears to be a continuous surface area may sometimes resemble a lake. As stated in the final EIR for the Topaz Solar Farm Project, “[t]he dark-colored, glass-surfaced PV fields would exhibit strong color and texture contrast against the light-colored and non-reflective grassland…” (San Luis Obispo County 2011b). The visual effects of the heliostat mirrors associated with the proposed project would be very different. The tops of the heliostat units would be more than 13 feet above the ground surface, and would move constantly to keep the reflective angle targeted on the SRSGs at the tops of the power towers. The site design for the Solar PV Alternative would include expanses of relatively uniform rows of PV modules that would absorb solar radiation. The overall visual effect of the proposed HHSEGS project would be greater with the heliostats arranged in a circular pattern around the base of the SPT to constantly reflect the sun’s rays to the top of the tower.

Environmental Impacts

Construction-related visual impacts of the Solar PV Alternative would be **less than the proposed HHSEGS project**. Views during project construction phases would include views of equipment and stored materials. The lack of extremely tall structures and cranes with FAA safety lighting under this alternative would reduce the severity of construction-related impacts on visual resources. At ground level, much of the construction activity would be screened, and conditions of certification would be implemented to screen views and reduce the impacts of construction area lighting.

PV solar modules would be less visually dominant than the heliostats and 750-foot SPTs and related structures. The Solar PV Alternative would not include structures that

would contrast with the scenic backdrops of the Nopah Wilderness Area, Pahrump Valley Wilderness Area, and the Spring Mountains and overwhelm the views. The Solar PV alternative would present similar challenges to screening the structures from view at key observation point (KOP) 3, but the potential impacts on the more distant views toward the site from KOPs 4, 5, and 7 would be lower without the visually dominant SPTs. In fact, it might be that this alternative would not be visible at all from KOPs 4 and 7. The view from KOP 5 would be of an array that could resemble a lake surface. This view could slightly mimic views of the Pahrump dry lake bed north of Charleston View. (Refer to the **Visual Resources** section of this staff assessment for detailed assessments of the KOPs for the proposed project.)

The proposed HHSEGS site is relatively flat, and the heights of the PV modules for this alternative, mounted on their support posts, would be relatively consistent across the site. The visual impacts of the Solar PV Alternative in Charleston View could potentially be reduced to less than significant, assuming the impacts of this alternative would be much lower for views of wilderness and recreation areas. The extent and severity of glint and glare effects would be lower compared to the proposed project. Views from the wilderness and recreation areas, including the Old Spanish National Historic Trail alignment, would be impacted but to a lesser degree. Overall, the visual impacts of this alternative would be **much less than the proposed HHSEGS project**.

Waste Management

The location of the Solar PV Alternative would be the same as the proposed project, and it would be no closer to any unidentified recognized environmental conditions. Similar to the proposed project, staff would require investigation and remediation of soil and groundwater contamination if it was encountered during construction and operation of this alternative.

A solar panel (PV module or PV panel) is a packaged, connected assembly of PV cells. The materials presently used in PV modules include, but are not limited to, mono-crystalline silicon, poly-crystalline silicon, and thin-film/amorphous silicon. The crystalline silicon is not considered hazardous. The thin-film PV modules can be fabricated from amorphous silicon, cadmium telluride (CdTe), or copper indium gallium (di) selenide. CdTe is a commonly used solar cell material for the manufacture of thin-film PV panels. The disposal and long term safety of cadmium telluride as a potentially hazardous waste is a known concern in the large-scale commercialization of cadmium telluride solar panels.

Construction and operation of the Solar PV Alternative could produce more hazardous wastes compared to the proposed HHSEGS project, depending on the chosen PV module technology. **Alternatives Table 5** describes four PV projects, including three projects that will use CdTe PV panels. Regardless of whether wastes from this alternative were determined to be hazardous, hazardous landfill capacity is available in Nevada, which is similar to the proposed project. Staff considers project compliance with LORS and staff's conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the

Solar PV Alternative. Impacts related to waste management would be **similar to the proposed HHSEGS project**.

If hazardous wastes were inadvertently discharged on the site, site characterization and remediation requirements would remain the same as for the proposed project. Staff concludes that compliance with applicable LORS and implementation of appropriate conditions of certification would be sufficient to ensure that no significant impacts would occur; however, there is an increased risk of potential impacts from PV cells that could contain potentially hazardous substances, which could be discharged to the environment. Depending on the type of PV module selected, the potential impact on human health and the environment would be **somewhat greater than the proposed HHSEGS project**.

Soil and Surface Water

Staff has not identified significant differences regarding the amount of grading needed for installation of PV panels that are either the fixed-tilt or tracking type. The same is true for the potential effects of this alternative on flood flows during project operations. This discussion of the potential impacts of the Solar PV Alternative on water quality applies to both types of PV panels.

PV systems do not use steam generators because receiver units directly generate electricity and thus do not require the steam boilers, generators, steam condensers, and/or auxiliary heat rejection equipment generally associated with a traditional power plant. As a result, characteristic impacts on water quality caused by the presence of power plant facilities would be **much less than HHSEGS** for a PV alternative, namely the disposal of industrial wastewater and the risk of storm water exposure to industrial chemicals. Domestic sanitary waste would still need a septic system for proper disposal, and impacts related to sanitary waste would be **similar to HHSEGS**.

As discussed above under, “Waste Management,” depending on the PV module technology, use of PV panels could cause the release of hazardous CdTe waste if panels were damaged. The inadvertent discharge of hazardous waste during a large storm event would increase the potential for water quality impacts from storm damage to **somewhat greater than HHSEGS**.

As discussed above, information in the final project approval documents for four solar PV projects in California indicate an average land use efficiency of approximately 7 acres per MW. Land use efficiencies of less than 7 acres per MW are being achieved at some utility-scale PV installations in the state (**Alternatives Table 5**). Assuming that PV module supports would involve similar low impact flow-through installation with similar land use efficiency as the proposed project, impacts from 100-year flood flows would be **similar to the proposed HHSEGS project** as well as the potential for on-site/off-site flooding.

The possible need to reconfigure the proposed HHSEGS site for installation of either fixed-tilt or tracking PV modules could change the site layout, including the dirt roads that would be constructed for access and maintenance of PV panels. Because of the

decrease in frequency for washing of PV panels compared to what would be required to maintain the heliostats under the proposed project, this alternative would create less dust overall from washer vehicles driving on the dirt roads. Impacts related to soil erosion during project operations would be **less than HHSEGS**.

Much like installation of heliostats for the proposed project, installation of the PV panels would not necessarily require significant site grading, and the Solar PV Alternative and the proposed project would need similar areas for construction laydown and temporary parking. The Solar PV alternative would not require the same level of construction activities needed to build traditional power plant facilities. Compared to the proposed project, this alternative would not require a temporary concrete batch plant for the solar tower or large foundations, or a temporary assembly building to construct heliostats. These construction activities for the proposed project would require more excavation, heavy equipment, personnel, and truck traffic, resulting in a higher erosion potential than the Solar PV Alternative. Based on these factors, the impacts from the PV Alternative related to soil erosion during construction would be **somewhat less than HHSEGS**.

Water Supply

Solar PV technology employs either fixed-tilt or tracking solar panels to collect incident radiation. Between these two options, staff has not identified significant differences in the potential impacts on groundwater resources.

The Solar PV Alternative would require less water for project operations, given the less frequent washings required for PV solar panels. Operational water use is estimated up to approximately 12 afy under the Solar PV Alternative. Impacts on the Pahrump groundwater basin and local well owners would be reduced relative to the proposed HHSEGS project. Given the lower water use for this alternative, potential impacts on water supply would be **somewhat less than HHSEGS**.

The groundwater basin is already in overdraft; therefore, any additional water use, no matter how little, could result in a cumulatively significant impact. If significant impacts were identified on water supply, the same conditions of certification proposed for the HHSEGS project would be recommended for this alternative, which would mitigate the impacts to a level that is less than significant.

PARABOLIC TROUGH ALTERNATIVE

Overview

This alternative would involve constructing and operating a utility-scale parabolic trough project at the proposed project site. A parabolic trough system converts solar radiation into electricity using sunlight to heat a thermal fluid, typically synthetic oil (i.e., the HTF). Parabolic trough power plants consist of horizontal, trough-shaped solar collectors that are arranged in parallel rows and aligned on a north-south horizontal axis. Each parabolic trough collector has a linear parabolic-shaped reflector that focuses the sun's rays on a linear receiver tube (i.e., heat collection element) suspended at the focal point of the curve-shaped collector. The trough rotates east to west to track the sun during

the day, heating the HTF circulating in the collection element. The heated HTF is then piped through a series of heat exchangers where it releases its stored heat to generate high pressure steam. The steam is then fed to a traditional steam turbine generator where electricity is produced. **Alternatives Figure 9** shows photographs of existing parabolic trough project facilities.

Beginning in 1984, nine solar power plants using parabolic trough technology were constructed in the Mojave Desert in San Bernardino County. Solar Electric Generating Systems (SEGS) III through VII are at Kramer Junction (**Alternatives Figure 9**), SEGS VIII and IX are at Harper Lake, and SEGS I and II are at Daggett near Barstow. The nine SEGS projects have a combined total capacity of 354 MWs. Natural gas-fired facilities provide additional operational flexibility for each of the SEGS projects. These power plants cover a combined total of more than 1,600 acres. Several online sources report that SEGS VIII and IX have operated successfully and without interruption from the beginning (i.e., since they began operating in 1990 and 1991, respectively).

In February 1999, a 900,000-gallon storage tank containing the HTF, therminol, exploded at the SEGS II solar power plant, sending flames and smoke into the sky. As reported at the time, “[f]irefighters ‘tried to put water on it and said it was like putting out a house fire with a garden hose’” (Los Angeles Times 1999). At the time of the accident, authorities worked to keep flames away from two adjacent containers that held sulfuric acid and caustic soda, both toxic substances. Police and fire officials evacuated a half-square-mile area around the facility; no injuries were reported.

In 2008 and 2009, the Energy Commission received AFCs for several renewable energy projects that were proposed to use parabolic trough technology. Staff is monitoring construction of two of the projects that were licensed by the Energy Commission in September 2010—the Abengoa Mojave Solar Project (AMSP) and the Genesis Solar Energy Project (GSEP). Neither of these projects includes energy storage.

AMSP is near Harper Lake in San Bernardino County, about 9 miles northwest of the community of Hinkley. The SEGS VIII and IX facilities are immediately northwest of the AMSP site. GSEP is in the Sonoran Desert of east central Riverside County, about 25 miles west of Blythe. Each project consists of two 125-MW power plants for a combined total capacity of 500 MWs. Commercial operation of AMSP is anticipated in winter 2013. Commercial operation of the two GSEP power plants is anticipated to occur consecutively in spring 2013 and 2014. Natural gas-fired auxiliary boilers will provide equipment and HTF freeze protection for each 125-MW power island for the two projects.

When construction of AMSP is finished, it will cover approximately 1,765 acres. GSEP will cover approximately 1,800 acres. Land use efficiency for each project is a little over 7 acres per MW, which is comparable to the average land use efficiency for BrightSource Energy’s proposed HHSEGS and Rio Mesa SEGF projects.

AMSP will use wet cooling, and maximum operational water use for the project will total approximately 2,160 afy. GSEP will use dry cooling, requiring approximately 202 afy.

Potential to Attain Project Objectives

Development of an approximately 500-MW parabolic trough project at the proposed project site could potentially meet the project objectives related to construction and operation of a utility-scale renewable electrical generation facility, which would lead to the sale of renewable energy and contribute to achieving California's renewable energy goals; approval of amendments to the PPAs by CPUC could be required. This alternative could potentially satisfy the project objective to meet permitting requirements and comply with applicable LORS. This alternative would satisfy the project objective to develop a renewable energy facility in an area with high solar value and minimal slope. The Parabolic Trough Alternative could potentially satisfy the project objective to avoid or minimize significant impacts to the greatest extent feasible, although site grading and earthwork for a parabolic trough project generally requires removal of all vegetation and mass grading to level the site. Construction of engineered drainage channels is required to direct stormwater runoff around the solar field(s). The extent and intensity of ground disturbance could be greater under this alternative compared to the proposed project. See the discussions below under, "Environmental Analysis," for general analyses of the potential environmental effects of the Parabolic Trough Alternative.

Staff submitted data requests for additional information to compare the proposed HHSEGS project to an alternative using parabolic trough technology at the HHSEGS site. In the corresponding data responses, the applicant describes how "the HHSEGS site is roughly triangular in shape, and trough plants can only be built in large rectangles. An analysis of the HHSEGS site shows that about 25 percent of the site could not be exploited for a reasonable trough alternative…." (Hidden Hills Solar I and II, LLCs 2012b). Staff does not have information to confirm the accuracy of this estimate.

The Parabolic Trough Alternative could potentially satisfy five or six of the seven project objectives. Like the proposed project, this alternative would have a limited ability to satisfy the project objective addressing operational flexibility. The proposed 3,277-acre project site could possibly be used for construction of a parabolic trough project. Because this alternative would use the proposed project site, the objective to obtain site control and use within a reasonable period of time would be attained. The total potential generating capacity of this alternative is unknown and could be less than the proposed 500-MW capacity of the proposed project.

Potential Feasibility Issues

Changing the project technology at the HHSEGS site to a parabolic trough technology would likely require filing of an amended advice letter with CPUC requesting amendments to the PPAs, at least with regard to schedule. The work required to redesign the project and reconfigure the site to use a parabolic trough technology would delay the project schedule, and it is not known whether CPUC would approve amendments to the PPAs allowing the change, if such approvals would be necessary. It is not known at what point a project schedule delay would affect project viability.

Environmental Analysis

Alternatives Table 7 presents a summary comparison of impacts of the proposed HHSEGS project to the same or similar potential impacts of the Parabolic Trough Alternative. Comparative discussions for each environmental topic area follow the table.

Alternatives Table 7
Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative

Environmental Effect	Proposed Project	Parabolic Trough Alternative
Air Quality		
Construction-related emissions	SM	Similar to HHSEGS (SM)
Project operations emissions	SM	Similar to HHSEGS (SM)
Biological Resources		
Impacts on special-status plant species	SM	Same as HHSEGS (SM)
Impacts on waters of the U.S. and waters of the state	SM	Same as HHSEGS (SM)
Impacts on desert tortoise	SM	Same as HHSEGS (SM)
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	SM	Same as HHSEGS (SM)
Impacts on avian species from collisions with project features (see biological resources note)	PSU	Unknown (PSU)
Impacts on avian species from exposure to concentrated solar flux	PSU	—
Potential impacts on groundwater dependent ecosystems	PSM	Similar to HHSEGS (PSM)
Biological resources note: Collisions could be secondary to retinal damage from glint or glare.		
Cultural Resources		
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see note)	LS	Similar to HHSEGS (LS)
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	SU	Much less than HHSEGS (PSM)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *on* the site	SM	Similar to HHSEGS (SM)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *beyond* the site	SU	Somewhat less than HHSEGS (PSM)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	SU	Similar to HHSEGS (PSU)

Alternatives Table 7 Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative		
Environmental Effect	**Proposed Project**	**Parabolic Trough Alternative**
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	SU	Somewhat less than HHSEGS (PSU)
Note: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site.		
Fire Protection		
Potential impacts on local fire protection resources	PSM	Much greater than HHSEGS (SM)
Potential impacts on emergency response services	PSM	Much greater than HHSEGS (SM)
Geology and Paleontology		
Potential impacts from strong seismic shaking	SM	Much less than HHSEGS (PSM)
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	SM	Much less than HHSEGS (PSM)
Potential impacts on paleontological resources	SM	Less than HHSEGS (PSM)
Potential impacts on geological or mineralogical resources	LS	Same as HHSEGS (LS)
Hazardous Materials		
Potential for release of hazardous materials to occur on-site	SM	Somewhat greater than HHSEGS (SM)
Potential for release of hazardous materials to occur off-site	SM	Somewhat greater than HHSEGS (SM)
Land Use		
Conflicts or inconsistencies with general plan land use designations and zoning	SU	Same as HHSEGS (SU)
Conversion of agricultural land	—	—
Noise and Vibration		
Potential for noise to impact noise-sensitive receptors	PSM	Similar to HHSEGS (PSM)
Public Health		
Potential for project construction to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Potential for project operations to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Socioeconomic Resources		
Construction employment and increased taxes and fees	B	Similar to HHSEGS (B)

Alternatives Table 7 Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative		
Environmental Effect	**Proposed Project**	**Parabolic Trough Alternative**
Displacement of existing rural residences	—	—
Potential impacts on emergency medical and law enforcement services	PSM	Similar to HHSEGS (PSM)
Traffic and Transportation		
Potential impacts on roadway infrastructure	SM	Same as HHSEGS (SM)
Potential for glint and glare to cause safety hazards or a distinct visual distraction effect from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	PSM	Less than HHSEGS (PSM)
Potential for construction equipment and/or permanent structures to exceed 200 feet in height above ground level	SM	—
Transmission Line Safety and Nuisance		
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	SM	Similar to HHSEGS (SM)
Visual Resources		
Construction-Related Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Similar to HHSEGS (PSM)
Project Operations Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Somewhat less than HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Somewhat less than HHSEGS (SU)
Waste Management		
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	SM	Similar to HHSEGS (PSM)
Potential for impacts on human health and the environment related to past or present soil or water contamination	PSM	Similar to HHSEGS (PSM)
Soil and Surface Water		
Soil erosion by wind and water during project construction	SM	Much greater than HHSEGS (SM)

Alternatives Table 7 Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative		
Environmental Effect	**Proposed Project**	**Parabolic Trough Alternative**
Soil erosion by wind and water during project operations	PSM	Less than HHSEGS (PSM)
Water quality impacts from contaminated storm water runoff	SM	Somewhat greater than HHSEGS (SM)
Water quality impacts from storm damage	PSM	Greater than HHSEGS (PSM)
Water quality impacts from power plant operations	SM	Similar to HHSEGS (SM)
Water quality impacts from sanitary waste	SM	Similar to HHSEGS (SM)
Potential impacts from on-site and off-site flooding	SM	Much less than HHSEGS (SM)
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency Management Agency maps	LS	Similar to HHSEGS (LS)
Water Supply		
Potential impacts on local wells	PSM	Similar to HHSEGS (PSM)
Potential impacts on groundwater basin balance	PSM	Similar to HHSEGS (PSM)

Air Quality

The number and type of emitting sources during project operations under the Parabolic Trough Alternative would be the same or similar to those of the proposed project; however, this alternative would likely use a heat transfer fluid (HTF) in the receiver tubes of the parabolic mirrors during project operations. When HTF leaks from project apparatus (e.g., piping, flanges, leaks, etc.) it vaporizes into small amounts of volatile organic compounds (VOCs), which are ozone precursors. The local air district would most likely require controls to minimize impacts at the project site. Overall, air quality impacts would be **similar to HHSEGS** for the Parabolic Trough Alternative. Construction-related emissions and impacts would be **similar to HHSEGS** for this alternative. Similar to the proposed project, this alternative would cause an overall cumulative reduction in GHG emissions from power plants; however, more stringent conditions of certification would be required compared to the proposed project to ensure that the Parabolic Trough Alternative would not make a cumulatively considerable contribution to a significant cumulative impact associated with air quality.

Biological Resources

The Parabolic Trough Alternative would be constructed and operated at the proposed HHSEGS site. Therefore, impacts on special-status plants, waters of the state, and

waters of the U.S. would be **the same as HHSEGS**. Impacts on desert tortoise and other special-status wildlife species would also be **the same as HHSEGS**.

Parabolic trough technology has the potential to impact avian species from collisions with solar troughs and other project facilities or transmission lines, exposure to glint and glare and the effects of polarized light pollution, and loss of habitat. The analysis of glint and glare impacts for the Blythe Solar Power Project (originally licensed by the Energy Commission as a parabolic trough project) concluded that pedestrians within approximately 60 feet of the solar field perimeter fencing could experience unsafe light intensity (Energy Commission 2010b). It is unknown how glint and glare effects from the Parabolic Trough Alternative would affect the vision of avian species; therefore, the level of significance of this impact is unclear. Similarly, the extent and severity of injury and mortality from collision with project structures under the Parabolic Trough Alternative are unknown, although the Energy Commission decision for the Blythe Solar Power Project concluded that impacts on avian species could be mitigated below a level of significance with implementation of Condition of Certification **BIO-15**, which would have been achieved through preparation and implementation of an "Avian Protection Plan" to monitor the death and injury of birds from collisions with facility features. **BIO-15** further requires that the monitoring data would be "used to inform an adaptive management program that would avoid and minimize project-related impacts" (Energy Commission 2010c). The Parabolic Trough Alternative would not require central collector towers, which would eliminate the potential for avian species to collide with extremely tall structures. However, without further data, staff concludes that impacts on avian species from collisions with project features under this alternative cannot be reasonably compared to the proposed project; and a conclusion for comparative avian impacts is **unknown**. No on-site avoidance measures for this impact are feasible; therefore, avian collision impacts would remain potentially significant and unavoidable.

By comparison, the proposed project would also have the potential to impact avian species through exposure to concentrated solar flux and loss of habitat. Parabolic trough technology does not concentrate solar flux over the solar field; therefore, **no impacts** on avian species from exposure to concentrated solar flux would occur under this alternative. Impacts related to habitat loss could be reduced to less than significant with implementation of appropriate mitigation measures.

Staff assumes this alternative would use dry cooling processes, with groundwater pumping for operational use similar to that of the proposed project. Under those conditions, potential impacts on groundwater dependent plants and associated wildlife species would be **similar to HHSEGS**. Conditions of certification would be recommended to reduce the project's potential effects on groundwater dependent plants and wildlife species to below a level of significance.

Cultural Resources

Construction and operation of the Parabolic Trough Alternative at the proposed project site could increase the extent of physical ground disturbance on the project site due to the extensive site grading and leveling that would be required. However, staff has concluded that the potential to disturb, destroy, or visually degrade significant

prehistoric and historical on-site archaeological resources would be **similar to HHSEGS**; like the proposed project, the impact conclusion is less than significant for archaeological and built-environment resources. Due to the character of the ethnographic resources present *on* the facility site, the impact on those resources would remain potentially significant and unavoidable.

The vertical profile of this alternative would be dramatically reduced without the proposed HHSEGS power towers. The overall visual impacts of this alternative on the broad, landscape-scale resources that are of concern to staff and the relative visual intrusion on off-site resources would be **much less than HHSEGS** for the Parabolic Trough Alternative. The overall physical disturbance of the portions of the resources on the facility site, although small relative to the broad scales of the subject landscapes, would nonetheless be roughly comparable to the site disturbance that would occur under the proposed project. Staff characterizes the net effect of this alternative on historical resources as **much less than HHSEGS**. Of the impacts identified by cultural resources staff, two impacts addressing archaeological and built-environment resources *beyond* the site that are considered "significant and unavoidable" under the proposed project would be reduced to "potentially significant" under this alternative (see **Alternatives Table 7**). These two impacts could be reduced to less than significant with implementation of appropriate compensatory mitigation measures.

Impacts addressing two ethnographic resources *on* and *beyond* the site that are considered "significant" under the proposed project are considered "potentially significant" under this alternative. These two impacts are considered, **similar to HHSEGS**, and, **somewhat less than HHSEGS**, respectively. Because no feasible means of compensation are available to reduce these impacts on aboriginal ancestral territory, staff concludes that these two impacts would remain significant and unavoidable under the Parabolic Trough Alternative.

Fire Protection

The Parabolic Trough Alternative would require the use of significant amounts of combustible HTFs, which would significantly increase the fire risk at the facility and would also increase the potential for project construction and operations impacts on local fire protection resources that protect communities currently served by such resources. This alternative would also require a significant number of deliveries of HTF to the site during project construction. Traffic accidents, including those that could potentially cause spillage of flammable materials, would increase the need for emergency response services and potential impacts on local fire protection resources. Impacts on fire protection services and resources under the Parabolic Trough Alternative would be **much greater than HHSEGS**. Staff has determined that impacts on the local fire department would be significant under this alternative due to the predicted increase in emergency response calls during project construction and operation. Mitigation measures would require payment of as yet undetermined project-specific fees to the local fire protection service to enable augmentation of resources such as staff, equipment, and facilities. With implementation of appropriate mitigation

measures, impacts on local emergency services would be reduced to less than significant.

Geology and Paleontology

Construction and operation of the Parabolic Trough Alternative at the proposed project site could have fewer impacts compared to the proposed HHSEGS project. As discussed above, the Solar PV Alternative would not require the deep or otherwise specialized foundations that would be required for the SPTs and the numerous heliostat foundations of the proposed project. However, the Parabolic Trough Alternative would require relatively deep foundations (as deep as 20 feet below ground surface), but they would fewer in number, larger in diameter, and constructed in drilled soil borings from which soils could be monitored and fossils recovered. The reduction in the number of deep foundations would decrease the potential for encountering fossil-bearing strata, and due to the elimination of the SPTs, this alternative as a whole would be much less susceptible to the effects of strong seismic shaking. The net effect of potential impacts on geological and paleontological resources under this alternative would be **less than HHSEGS**.

Hazardous Materials

The Parabolic Trough Alternative would require the use of significant amounts of HTF, which is a combustible material. The potential for off-site impacts in the event of an accidental release of hazardous materials would increase under this alternative due to the substantial increase in use of combustible liquid that is required with this technology. However, because of the site's remote location, an accidental release of hazardous materials is unlikely to cause significant impacts at the facility. This alternative would also involve the transport of significant amounts of combustible HTF to the site, which could increase risks to road users and populations living along transportation routes to the facility if an accidental release of hazardous materials occurred. Additional conditions of certification would be required to reduce significant impacts to less than significant. This impact is **somewhat greater than HHSEGS**.

Land Use

Construction and operation of the Parabolic Trough Alternative at the proposed project site would be inconsistent with Inyo County's designated land uses (OSR and REC) and zoning for the Charleston View area (OS-40). An amendment to the Inyo County General Plan would be required to ensure consistency of this alternative with the Land Use Element. Land use impacts would be the **same as HHSEGS** for the Parabolic Trough Alternative.

Noise and Vibration

Similar to the SPT technology, in an alternative project using the parabolic trough technology, the power blocks would be the chief noise producers. This technology, with its power blocks located in the center of each mirror field, would have similar noise impacts as those expected from HHSEGS. Impacts related to noise would be **similar to HHSEGS** under this alternative. Like the proposed project, conditions of certification

would be required to ensure that potentially significant noise impacts were reduced to less than significant during project construction and operation.

Public Health

The Parabolic Trough Alternative would require the use of similar equipment and apparatus for project operations as the proposed project. For both technologies, emissions would occur from vehicles and equipment that would be used to clean the mirrors. However, this alternative could cause emissions of small amounts of VOCs from potential leaks of HTF from flanges or that could be lost during routine maintenance activities such as HTF pipeline repair or replacement. Combustion-related criteria pollutants and hazardous air pollutants (HAPs) emissions are also possible from process boilers. Such emissions would occur at low levels; therefore, this alternative technology would not pose a significant risk from the emissions of concern in the public health analysis. This impact would be **similar to HHSEGS** for construction and operations emissions. No significant impacts would occur, and no conditions of certification would be required.

Socioeconomic Resources

Under the Parabolic Trough Alternative, the beneficial impact through construction employment and increased taxes and fees would be **similar to HHSEGS**. Potential impacts on emergency medical and law enforcement services would be **similar to HHSEGS**. Like the proposed HHSEGS project, this alternative would increase demand for these public services; however, similar mitigation measures would reduce these impacts to less than significant.

Traffic and Transportation

Similar to the proposed project, the Parabolic Trough Alternative would require use of SR 160 and the Old Spanish Trail Highway for hauling of equipment and materials to the project site, which could cause a significant impact on the structural integrity of the road due to the current and predicted future conditions of the roadway pavement. This impact would be the **same as HHSEGS**.

A parabolic trough is constructed as a long parabolic mirror. The trough is usually aligned on a north-south axis and rotated east-west to track the sun. Glint and glare from specular reflection off the troughs could occur when the troughs are moving from a stow to a tracking position and from a tracking to a stow position. This rotation occurs at the beginning and end of daily operations. This flash of brightness can be classified as an intrusive bright nuisance and optical hazard at short distances. As such, there would be the potential for specular reflection from the parabolic troughs associated with this alternative to affect motorists on the Old Spanish Trail Highway. Given that this alternative would not include power towers topped by SRSGs, it is assumed that potential impacts related to glint and glare would be **less than the proposed HHSEGS project**. Like the proposed project, this alternative would require preparation and implementation of a plan to ensure continuous monitoring of the heliostat mirrors for malfunctions and to ensure that they would remain properly aligned with the sun. (See Condition of Certification **TRANS-8** in this staff assessment.)

Staff reviewed the decisions for several of the parabolic trough projects that were licensed by the Energy Commission in 2010. No construction equipment or permanent structures were identified for those projects that would be taller than the projects' transmission lines, which are less than 200 feet tall. No structures would necessarily require review and approval by FAA, and **no impact** would occur under the Parabolic Trough Alternative.

Transmission Line Safety and Nuisance

Under the Parabolic Trough Alternative, the utilized transmission lines and related impacts would be of the same magnitude as those discussed for the proposed HHSEGS project in this staff assessment. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to HHSEGS**.

Visual Resources

Comparison of the Proposed HHSEGS Project to the Parabolic Trough Alternative

Similar to the Solar PV Alternative, the solar collectors associated with the Parabolic Trough Alternative would be arranged in parallel rows across the site. However, the basic processes to produce electricity under this alternative are similar to those of a power tower project. Project components for the Abengoa Mojave Solar Project include the two steam turbine generator buildings, each measuring approximately 73 feet tall, 42 feet long, and 108 feet wide. Most other structures will be less than 50 feet tall. The solar collector arrays are approximately 21 feet tall. The tallest structures are the 80- to 110-foot-tall transmission line monopoles. The overall vertical profile of the Parabolic Trough Alternative would be more uniform across the site compared to the proposed project.

Under this alternative, the parabolic trough solar collectors would be reflective on the mirror side. Sufficient setback distances, use of non-reflective finishes on the back side of the troughs, and visual screening measures could potentially mitigate the effects of glint and glare at KOP 3. Intervening ground plane elements would likely block views of the troughs from KOP 1, KOP 2, and KOP 4, but the project's other taller structures could be partially visible from KOPs 1 and 4. Conditions of certification, such as specifying the use of non-reflective surface finishes complementary to the desert landscape, could reduce impacts to less than significant at KOP 4. Views from KOP 5 would still be significantly altered because of the higher angle of views toward the reflective array of solar troughs. These impacts would remain significant and unavoidable under the Parabolic Trough Alternative. Visual resources impacts at KOP 6 could be reduced to less than significant with implementation of appropriate mitigation measures. It is difficult to characterize the visual impact on the view from KOP 7 without a visual simulation. It is likely that the arrays would appear prominently in the middle ground, as would this alternative's taller structures. Under existing conditions, there is little to impede the view from KOP 7. The visual impacts on the view from the Old Spanish National Historic Trail and the Pahrump Valley Wilderness would remain significant and unavoidable.

Environmental Impacts

Construction-related visual impacts of the Parabolic Trough Alternative would be **similar to the proposed HHSEGS project**. Views during project construction phases would include views of equipment and stored materials. The lack of extremely tall structures and cranes with FAA safety lighting under this alternative would reduce the severity of construction-related impacts on visual resources. At ground level, much of the construction activity would be screened, and conditions of certification would be implemented to partially screen views and reduce the impacts of construction area lighting. Staff identifies a "significant and unavoidable" impact for construction-related light or glare effects under the proposed project. Because the Parabolic Trough Alternative would not require lighting of extremely tall construction equipment and support structures, construction-related light or glare effects could be reduced compared to the proposed project to "less than significant" with implementation of appropriate mitigation measures. However, implementation of feasible mitigation measures would not be sufficient to reduce the overall level of effects to less than significant, and construction-related impacts on the existing visual character or quality of the site and its surroundings would remain significant and unavoidable.

Conditions of certification requiring sufficient setback distances, use of non-reflective finishes on the backs of the troughs, and visual screening measures could potentially reduce the visual impacts at KOPs 3 and 4 to less than significant. Overall, the visual impacts identified for the proposed project would be reduced under the Parabolic Trough Alternative. The visual analysis for the proposed HHSEGS project identifies significant and unavoidable impacts at six of the seven KOPs. Visual impacts under this alternative at KOPs 5 and 7 would be significant and unavoidable under the Parabolic Trough Alternative. The overall alternative project operations impacts on visual resources would be **somewhat less than the proposed HHSEGS project**. The net effect of this alternative on visual resources is considered significant and unavoidable due to the high reflectivity of the parabolic mirrors; no feasible mitigation measures could fully reduce the net effect to a less-than-significant level.

Waste Management

The location of the Parabolic Trough Alternative would be the same as the proposed project, and it would be no closer to any unidentified recognized environmental conditions. Similar to the proposed project, staff would require investigation and remediation of soil and groundwater contamination if it was encountered during construction and operation of this alternative. Site characterization and remediation requirements would remain the same as for the proposed project.

The Parabolic Trough Alternative would produce less waste than the proposed HHSEGS project based on a comparison to waste estimates provided for two parabolic trough projects that were licensed by the Energy Commission in 2010 (Genesis and Beacon Solar Energy Projects). Similar to the proposed project, staff considers project compliance with LORS and staff's conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated

with the Parabolic Trough Alternative. Potential impacts on existing waste disposal facilities and human health and the environment would be **similar to HHSEGS**.

Soil and Surface Water

The Parabolic Trough Alternative would require traditional power plant facilities similar to the proposed project; therefore, potential impacts caused by the disposal of industrial wastewater would be **similar to HHSEGS**. However, the added risk of accidental leaks or spills of heat transfer fluid would increase the potential impacts of contaminated storm water runoff for the Parabolic Trough Alternative. This is an impact that would be unique to the Parabolic Trough Alternative; therefore, potential impacts related to contaminated storm water runoff would be **somewhat greater than HHSEGS**. Domestic sanitary waste would still need a septic system for proper disposal, so these impacts would be the **similar to HHSEGS**.

A technical limitation for parabolic trough facilities is the need for very flat terrain. Because the piping interconnecting of the troughs has a very low tolerance for change in slope, the parabolic troughs need to be on less than 2 percent slope, and preferably less than 1 percent (BLM 2010). Land requirements for utility-scale parabolic trough power plants that have been reviewed by staff range from about 5 acres per MW to a little over 7 acres per MW. Assuming a project site with the same net MW output as the proposed project, the acreage requirement for a parabolic trough alternative could be about the same as the proposed project. The additional amount of total soil disturbance would significantly increase due to the need to level the site for installation of parabolic troughs. As a result, impacts related to soil erosion during construction would be **much greater than HHSEGS** for the Parabolic Trough Alternative as thousands of acres would require vegetation removal and grading, compared to the low impact flow-through layout required for installation of heliostats.

The need for flat terrain results in very different approaches to storm water management between the two technologies. For parabolic trough technologies, large channels just within the project borders would typically be constructed to divert off-site flows away from the solar fields. These channels would help protect the site from off-site flows, so impacts due to on-site flooding would be reduced to less than significant and, therefore, would be **much less than HHSEGS**. However, potential impacts on these diversion channels from storm damage would be **greater than HHSEGS** because flows from multiple existing ephemeral channels would combine, which would increase discharge rates and runoff volumes. Impacts from 100-year flood flows (as shown on the FEMA maps) would be **similar to HHSEGS** for this alternative because the published flood plain boundaries cross the project footprint at two relatively small areas where diversion channels would not adversely impede or redirect flows.

A parabolic trough alternative would utilize soil stabilizers within the solar fields to reduce the amount of dust deposited on the solar collectors (dust adversely affects their efficiency). Therefore, despite the fact that many more acres of land would be disturbed, impacts related to soil erosion during operations likely would be **less than the proposed HHSEGS project**. In addition, the flat slopes and grading would prevent on-

site runoff from concentrating, resulting in shallow sheet flow which minimizes the potential for surface erosion.

Water Supply

Parabolic technology employs a similar steam cycle, and water use for this type of project would be similar to water use proposed for the HHSEGS project assuming dry cooling. Therefore, potential impacts on the Pahrump groundwater basin and local well owners would be **similar to HHSEGS**. These impacts would be potentially significant, and the proposed conditions of certification would be similar to those proposed for the HHSEGS project. Potential impacts on water supply would be mitigated to below a level of significance.

REDUCED ACREAGE ALTERNATIVE

Overview

The Reduced Acreage Alternative would involve reducing the total project acreage of the proposed project to approximately 1,694.5 acres and constructing and operating an approximately 250-MW SPT project at the proposed HHSEGS site. The technology for the Reduced Acreage Alternative would be the same as described for the proposed HHSEGS project. This alternative retains Solar Plant 2 from the proposed HHSEGS project, including one 750-foot SPT, and the adjacent 103-acre common area. **Alternatives Figure 10** shows the alternative site. The proposed natural gas pipeline and transmission line for this alternative are shown to follow the same routes as for the proposed project. A total of approximately 85,000 heliostats would be installed under this alternative. The temporary construction area for the proposed project is reduced to approximately 90 acres and relocated to the northwest corner of the alternative site. The total acreage for this alternative includes the 90-acre temporary construction area.

The Reduced Acreage Alternative was added to staff's alternatives analysis for publication in the final staff assessment and responds to comments on staff's alternatives analysis in the preliminary staff assessment requesting consideration of an alternative with a smaller site footprint.

Potential to Attain Project Objectives

Development of an approximately 250-MW SPT project using the same technology as the proposed HHSEGS project would partially satisfy the first project objective to construct and operate a renewable electrical generation facility resulting in the sale of competitively priced renewable energy consistent with the needs of California utility companies; however, the total proposed 500-MW capacity would not be achieved. The Reduced Acreage Alternative could potentially meet the project objective related to development of a renewable energy facility to contribute to achieving California's renewable energy goals.

This alternative could potentially satisfy the project objectives addressing the requirement to comply with applicable LORS and avoid or minimize significant impacts to the greatest extent feasible. Staff observes that impacts on some resources would be

reduced under this alternative compared to the proposed project, particularly when there is a direct correlation between project acreage and the extent of the impact. It is likely that the objective to obtain site control and use within a reasonable period of time could be attained for this alternative. The Reduced Acreage Alternative would satisfy the project objective to develop a renewable energy facility in an area with high solar value and minimal slope. See the discussions below under, "Environmental Analysis," for general analyses of the potential environmental effects of the Reduced Acreage Alternative.

The Reduced Acreage Alternative could potentially satisfy five of the seven project objectives. Like the proposed project, this alternative would have a limited ability to satisfy the project objective addressing operational flexibility. This alternative could potentially satisfy the project objective to construct and operate a renewable electrical generation facility, although the total energy capacity of approximately 500 MWs would not be achieved; this objective would be partially satisfied.

Potential Feasibility Issues

Staff presumes that the two solar plants under the proposed project are each the subject of one of the PPAs approved by CPUC in 2010. If the total energy capacity was reduced to approximately 250 MWs under the Reduced Acreage Alternative, it is unknown whether an amendment to either of the approved PPAs by CPUC would be required. It is not known whether eliminating Solar Plant 1 from the northern portion of the proposed HHSEGS site would result in a project schedule delay, which could potentially affect project viability.

Environmental Analysis

Alternatives Table 8 presents a summary comparison of impacts of the proposed HHSEGS project to the same or similar potential impacts of the Reduced Acreage Alternative. Comparative discussions for each environmental topic area follow the table.

Alternatives Table 8
Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage Alternative

Environmental Effect	Proposed Project	Reduced Acreage Alternative
Air Quality		
Construction-related emissions	SM	Similar to HHSEGS (SM)
Project operations emissions	SM	Somewhat less than HHSEGS (SM)
Biological Resources		
Impacts on special-status plant species	SM	Much less than HHSEGS (SM)
Impacts on waters of the U.S. and waters of the state	SM	Much less than HHSEGS (SM)

Alternatives Table 8 Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage Alternative		
Environmental Effect	**Proposed Project**	**Reduced Acreage Alternative**
Impacts on desert tortoise	SM	Much less than HHSEGS (SM)
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	SM	Much less than HHSEGS (SM)
Impacts on avian species from collisions with project features	PSU	Less than HHSEGS (PSU)
Impacts on avian species from exposure to concentrated solar flux	PSU	Less than HHSEGS (PSU)
Potential impacts on groundwater dependent ecosystems	PSM	Somewhat less than HHSEGS (PSM)
Cultural Resources		
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see note)	LS	Somewhat less than HHSEGS (LS)
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	SU	Somewhat less than HHSEGS (SU)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *on* the site	SM	Somewhat less than HHSEGS (SM)
Potential impacts on significant built-environment cultural resources (Old Spanish Trail – Mormon Road Northern Corridor) *beyond* the site	SU	Somewhat less than HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	SU	Somewhat less than HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	SU	Somewhat less than HHSEGS (SU)
Note: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site.		
Fire Protection		
Potential impacts on local fire protection resources	PSM	Somewhat less than HHSEGS (PSM)
Potential impacts on emergency response services	PSM	Somewhat less than HHSEGS (PSM)
Geology and Paleontology		
Potential impacts from strong seismic shaking	SM	Much less than HHSEGS (PSM)
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	SM	Much less than HHSEGS (PSM)

Alternatives Table 8 Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage Alternative		
Environmental Effect	**Proposed Project**	**Reduced Acreage Alternative**
Potential impacts on paleontological resources	SM	Much less than HHSEGS (PSM)
Potential impacts on geological or mineralogical resources	LS	Same as HHSEGS (LS)
Hazardous Materials		
Potential for release of hazardous materials to occur on-site	SM	Similar to HHSEGS (PSM)
Potential for release of hazardous materials to occur off-site	SM	Similar to HHSEGS (PSM)
Land Use		
Conflicts or inconsistencies with general plan land use designations and zoning	SU	Same as HHSEGS (SU)
Conversion of agricultural land	—	—
Noise and Vibration		
Potential for noise to impact noise-sensitive receptors	PSM	Similar to HHSEGS (PSM)
Public Health		
Potential for project construction to cause air toxics-related impacts that could affect public health	LS	Similar to HHSEGS (LS)
Potential for project operations to cause air toxics-related impacts that could affect public health	LS	Less than HHSEGS (LS)
Socioeconomic Resources		
Construction employment and increased taxes and fees	B	Similar to HHSEGS (B)
Displacement of existing rural residences	—	—
Potential impacts on emergency medical and law enforcement services	PSM	Similar to HHSEGS (PSM)
Traffic and Transportation		
Potential impacts on roadway infrastructure	SM	Same as HHSEGS (SM)
Potential for glint and glare to cause safety hazards or a distinct visual distraction effect from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	PSM	Similar to HHSEGS (PSM)
Potential for construction equipment and/or permanent structures to exceed 200 feet in height above ground level	SM	Same as HHSEGS (SM)
Transmission Line Safety and Nuisance		
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	SM	Similar to HHSEGS (SM)

Alternatives Table 8 Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage Alternative		
Environmental Effect	**Proposed Project**	**Reduced Acreage Alternative**
Visual Resources		
Construction-Related Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Similar to HHSEGS (SU)
Project Operations Impacts		
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	Similar to HHSEGS (SU)
Waste Management		
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	SM	Similar to HHSEGS (PSM)
Potential for impacts on human health and the environment related to past or present soil or water contamination	PSM	Similar to HHSEGS (PSM)
Soil and Surface Water		
Soil erosion by wind and water during project construction	SM	Less than HHSEGS (SM)
Soil erosion by wind and water during project operations	PSM	Less than HHSEGS (PSM)
Water quality impacts from contaminated storm water runoff	SM	Less than HHSEGS (SM)
Water quality impacts from storm damage	PSM	Somewhat less than HHSEGS (PSM)
Water quality impacts from power plant operations	SM	Less than HHSEGS (SM)
Water quality impacts from sanitary waste	SM	Somewhat less than HHSEGS (SM)
Potential impacts from on-site and off-site flooding	SM	Similar to HHSEGS (SM)
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency Management Agency maps	LS	Similar to HHSEGS (LS)

Alternatives Table 8 Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage Alternative		
Environmental Effect	**Proposed Project**	**Reduced Acreage Alternative**
Water Supply		
Potential impacts on local wells	PSM	Somewhat less than HHSEGS (PSM)
Potential impacts on groundwater basin balance	PSM	Somewhat less than HHSEGS (PSM)

Air Quality

The setting and existing conditions for this alternative are the same as for the proposed project. The existing ambient air quality does not change and the facility would still be within the same air basin and subject to the same LORS.

Assessment of Impacts and Discussion of Mitigation

The Reduced Acreage Alternative would essentially reduce the total construction and operations emissions of the proposed project by approximately 50 percent over each time period by eliminating the northern solar plant unit (Solar Plant 1). However, the maximum daily and annual construction emissions are assumed to be **similar to the proposed project**, assuming the same level of maximum activity but reducing the overall construction schedule from 29 months to slightly more than half the time, probably 15–18 months. Therefore, maximum construction emissions would be approximately the same as those shown in **Air Quality Table 7** in the **Air Quality** section of this staff assessment. Maximum construction period impacts for this alternative would also be approximately the same as shown in **Air Quality Table 9**. The maximum daily and annual operating emissions would be approximately 50 percent of those shown in **Air Quality Table 8** and **Air Quality Table 10**, respectively.

The maximum short-term and maximum annual construction pollutant concentration impacts for the Reduced Acreage Alternative could be as high, but no higher than that estimated for the proposed project, assuming the same maximum daily and annual construction activities. Therefore, the worst-case short-term and annual construction pollutant concentration impacts for this alternative are likely to be **similar to impacts shown for the proposed project** in **Air Quality Table 9**.

The maximum short-term and maximum annual operational air quality impacts for the Reduced Acreage Alternative are also likely to be **somewhat less than the proposed project** as shown in **Air Quality Table 10**. Because the duration of construction is about half, there is less likelihood that adverse meteorological conditions would occur, due to the stochastic nature of the atmosphere. However, any reduction in impacts is uncertain as the worst case impacts are also based on factors such as proximity to receptors and terrain as well as total emissions.

The Reduced Acreage Alternative would result in the following:

- The worst-case short-term construction emissions and ground level pollutant concentration impacts would be **similar to the proposed project** and would require the same level of mitigation. The total construction period and total construction emissions would be reduced from those required to construct the proposed project.
- The operation emissions and ground level pollutant concentration impacts would be **somewhat less than the proposed project**, but the same level of mitigation would be required.
- The benefits of the proposed project in displacing fossil fuel fired generation and reducing associated criteria pollutant and greenhouse gas emissions, potentially anywhere in the Western Electricity Coordinating Council, would be reduced by half.

CEQA Level of Significance

The level of significance under CEQA for the Reduced Acreage Alternative would be the **same as for the proposed project**, with the same significance rationale. Construction and operation of this alternative could cause significant NOx and particulate matter emission impacts. The mitigation measures recommended by staff for the proposed project would also apply to the Reduced Acreage Alternative, and impacts would be reduced to less than significant.

Biological Resources

This alternative would reduce the total project acreage to approximately 1,694.5 acres, using the southern portion of the site, which is Solar Plant 2 under the proposed project. A total of eleven special-status plant species are known to be located on the proposed project site, and of these, impacts on four plant species are considered significant and require mitigation to reduce the impacts to less than significant. The four plant species are gravel milk-vetch, Wheeler's skeletonweed, Torrey's joint, and Preuss' milk-vetch; and these species are distributed rather evenly across the Solar Plant 1 and Solar Plant 2 fields for the proposed project. The Reduced Acreage Alternative would generally avoid half of the mapped locations of these rare plant species identified at the proposed project site, and these impacts would be **much less than the proposed project**. Jurisdictional waters of the U.S. and the state, as identified and mapped all along the eastern boundary of the proposed project site, include slightly more acreage within the northern half of the project site (the Solar Plant 1 area). Impacts on waters of the U.S. and waters of the state under this alternative would be halved, and would, therefore, be **much less than HHSEGS**. Desert tortoise sign and tracks, along with other fully protected furbearing mammals (kit fox) and state species of special concern (burrowing owl) are known to have higher abundance within the northern portion of the proposed project site; therefore, impacts on these species under this alternative would be **much less than HHSEGS**.

The Reduced Acreage Alternative would eliminate one solar power tower and its associated heliostat field. Similar to the proposed project, the structures associated with this alternative could attract birds; it is unknown the extent to which eliminating one solar field would reduce the potential for collisions with project features. By the same reasoning, it is unknown the extent to which eliminating one solar field would reduce the

potential for exposure to concentrated solar flux. Staff concludes that impacts on avian species would be **less than HHSEGS**, to an unquantifiable degree, with elimination of one of the two solar fields. Potential impacts on the groundwater basin would be somewhat less than HHSEGS (see the subsection below, “Water Supply”); therefore, the impacts on groundwater dependent vegetation and associated plant and wildlife species would also be **somewhat less than HHSEGS**.

Cultural Resources

Construction and operation of the Reduced Acreage Alternative at the proposed project site would, by design, significantly reduce the extent of physical ground disturbance due to the reduced areal extent of the facility site. This alternative would produce a similar level of visual intrusion on off-site resources relative to the proposed project because the overall vertical profile of HHSEGS would remain essentially the same. Staff characterizes the net effect of this alternative on historical resources as **similar to that of HHSEGS**. The equivalent height of the vertical profile of the Reduced Acreage Alternative, although one power tower less dense, would nonetheless constitute a profound visual intrusion on the same off-site resources that would be impacted by the proposed project.

Fire Protection

The potential for incidents to occur under the Reduced Acreage Alternative would be similar to the proposed project (e.g., injuries, fires, hazardous materials spills), although because the site acreage and numbers of project structures would be reduced by approximately one-half, the occurrence probability for accidents and incidents would likely be reduced compared to the proposed project. Staff assumes that this alternative would require approximately half the crew size, half the number of heliostats to install and maintain, one less solar tower, and less traffic. In general, construction and operation of the Reduced Acreage Alternative would require half the tasks to be accomplished. Accidents and incidents requiring emergency response services would be expected to have somewhat less probability of occurring on average.

Similar to the proposed HHSEGS project, staff has determined that impacts on the local fire department would be potentially significant under this alternative due to the predicted increase in emergency response calls during project construction and operation. Mitigation measures would likely require payment of undetermined fees specific to this alternative to enable augmentation of resources such as staff, equipment, and facilities. Impacts on fire protection services and resources and corresponding fees under this alternative would be **somewhat less than HHSEGS**; implementation of appropriate mitigation measures would reduce potentially significant impacts to less than significant.

Geology and Paleontology

Construction and operation of the Reduced Acreage Alternative at the proposed project site could have significantly fewer impacts compared to the proposed HHSEGS project. Primarily, the Reduced Acreage Alternative would require installation of a deep or otherwise specialized foundation for the one power tower. This alternative would reduce

installation of heliostat foundations to approximately one-half of the number required for the proposed project. The reduced number of deep foundations would decrease the potential for encountering fossil-bearing strata, and due to elimination of one of the tall tower structures, this alternative as a whole would be less susceptible to the effects of strong seismic shaking. Potential impacts on geological and paleontological resources under this alternative would be **much less than HHSEGS**.

Hazardous Materials

Under the Reduced Acreage Alternative, the proposed project site would be reduced by approximately one half. The elements and major facility components for the solar plant that would be closest to the Old Spanish Trail Highway would be the same as described for the proposed project. This alternative would not necessarily reduce the potential risk of spillage or release of hazardous substances. As described for the proposed project, conditions of certification requiring conformance with applicable LORS would reduce potentially significant impacts to less than significant. No new or more severe significant off-site impacts would occur under this alternative. The potentially significant impacts under the Reduced Acreage Alternative would be **similar to HHSEGS**.

Land Use

The Reduced Acreage Alternative would be constructed and operated on approximately one half of the proposed project site. These lands are designated as Open Space and Recreation (OSR) and Recreation (REC) in the Inyo County General Plan. The zoning district is OS-40. The OSR and REC designations and OS-40 zoning do not allow for the development of large scale solar projects. As with the proposed project, the applicant would be required to apply for a general plan amendment and a zoning reclassification. Although this alternative would be constructed on less land compared to the proposed project, the Reduced Acreage Alternative would be inconsistent with Inyo County's designated land uses and zoning for the Charleston View area, and this land use impact would be the **same as the proposed HHSEGS project**.

Noise and Vibration

The Reduced Acreage Alternative would involve construction and operation of the one solar plant closest to the Old Spanish Trail Highway and approximately 900 feet from the closest sensitive receptors near the south side of the highway. The solar plant in the northern portion of the proposed HHSEGS site that is furthest from sensitive receptors would not be part of this alternative. Given the proximity of the power plant to the rural residences in the Charleston View area, impacts related to noise would be **similar to HHSEGS** under this alternative. Like the proposed project, conditions of certification would be required to ensure that potentially significant noise impacts were reduced to less than significant during project construction and operation.

Public Health

The technology for the Reduced Acreage Alternative would be the same as described for the proposed HHSEGS project. The Reduced Acreage Alternative would essentially reduce the total construction and operations emissions of the proposed project by

approximately 50 percent over each time period by eliminating one of the two units. With a smaller site footprint, toxic air emission levels under this alternative would be **less than HHSEGS** during operational periods. However, assuming the same level of maximum activity but reducing the overall construction schedule from 29 months to slightly more than half the time, probably 15–18 months, short-term emissions and impacts from toxic air contaminants during construction would be **similar to HHSEGS**. As discussed in the **Public Health** section of this staff assessment, potential air toxics-related impacts from operation of the proposed HHSEGS project would be below significance levels within the 6-mile radius of typical concern to staff; therefore; potential impacts within the same 6-mile radius from the Reduced Acreage Alternative would also be less than significant and no conditions of certification would be required. Any **short-term construction impacts would be similar to HHSEGS** and **long-term project operations impacts would be less than HHSEGS**.

Socioeconomic Resources

Under the Reduced Acreage Alternative, the beneficial impact through construction employment and increased taxes and fees would be less than HHSEGS. However, as noted in **Appendix Socio-1,** *Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generating System on Inyo County*, Inyo County's gains would be positive even if the amount of materials subject to sales tax is cut in half. Therefore, under the Reduced Acreage Alternative, the net present value of the project's fiscal impact on the County would still be positive. This impact would be **similar to HHSEGS**. Potential impacts on emergency medical and law enforcement services would be **similar to HHSEGS**. Like the proposed HHSEGS project, this alternative would increase demand for these public services; however, similar mitigation measures would reduce these impacts to less than significant.

Traffic and Transportation

Similar to the proposed project, the Reduced Acreage Alternative would require use of SR 160 and the Old Spanish Trail Highway for hauling of equipment and materials to the project site. Like the proposed project, daily trips under this alternative would have a significant impact on the structural integrity of the Old Spanish Trail Highway in Nevada and California due to the current and predicted future conditions of the roadway pavement. Although this alternative would reduce the number of trips by approximately half (2,000 daily trips compared to 4,000 daily trips, which are predicted for *peak month 19* under the proposed project), Old Spanish Trail Highway lacks shoulders and designed drainage, and is not built or designed for the proposed level of construction traffic that would occur with implementation of this alternative. This impact would be the **same as the proposed HHSEGS project**.

Many of the project elements and major facility components (e.g., heliostat mirrors) that could produce glint and glare effects under this alternative would be the same as those of the proposed HHSEGS project. However, this alternative would include one power tower topped by an SRSG compared to two power towers for the proposed project and approximately half the number of heliostats. Although this alternative would reduce the number of sources that could create glint and glare, the potential for glint and glare

effects would remain. Therefore, it is assumed that potential impacts related to glint and glare would be **similar to the proposed HHSEGS project**.

Because of the solar tower height, the applicant would be required to notify the FAA of construction pursuant to the Code of Federal Regulations, Title 14, Aeronautics and Space, Part 77. These regulations require FAA notification for any proposed structure over 200 feet in height AGL regardless of the distance from an airport. This impact would be **the same as HHSEGS**.

Transmission Line Safety and Nuisance

Under the Reduced Acreage Alternative, the transmission lines would be the same as shown for Solar Plant 2 under the proposed project. No differences in field and nonfield impacts are identified under this alternative, and the magnitude of impacts discussed for the proposed project would be **similar to those described for the proposed HHSEGS project** under this alternative.

Visual Resources

Under the Reduced Acreage Alternative, the project would consist of a single SPT with an SRSG at the location of Solar Plant 2, related generation facilities, and a 103-acre common area. Solar Plant 2 includes the power tower closest to Old Spanish Trail Highway/Tecopa Road as depicted for the proposed HHSEGS project. Like the proposed HHSEGS project with two power towers, implementation of conditions of certification would reduce potential impacts on visual resources for views at the ground plane. Potential impacts of structural lighting could be partially mitigated with implementation of standard conditions of certification to control lighting and screen views. No feasible mitigation measures would reduce the visual impacts of the SPT, brightness of the SRSG, and potential visual effects of FAA night safety lighting. Similar to the proposed project, this alternative could cause substantial degradation of the existing visual character or quality of the site and its surroundings. Visual resources impacts would remain significant and unavoidable. The potential visual effects of the Reduced Acreage Alternative would be **similar to the proposed HHSEGS project**.

This alternative would not worsen impacts of the proposed project nor make a cumulatively considerable contribution to any significant cumulative impact associated with visual resources.

Waste Management

The potential presence of environmental concerns under the Reduced Acreage Alternative would be similar to the proposed project. Site characterization and remediation requirements would remain the same as for the proposed project.

Development of one solar power tower facility instead of two facilities under this alternative would decrease the volume of the waste stream. Adequate available Class III landfill capacity is available in Nevada landfills. Similar to the proposed project, staff considers project compliance with LORS and staff's conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste

management associated with the Reduced Acreage Alternative. Potential impacts on existing waste disposal facilities and human health and the environment would be **similar to HHSEGS**, even with the waste stream volume reductions.

Soil and Surface Water

Because the footprint for the Reduced Acreage Alternative would decrease to roughly half that of HHSEGS, impacts related to soil erosion during construction (grading of roadways and power plant construction) and operations (heliostat washing and vegetation maintenance) would be **less than the proposed HHSEGS project**. Operation of one power plant compared to two would decrease the volume of process wastewater and contamination of storm water runoff; therefore, these impacts would be **less than HHSEGS**. The number of septic systems for proper disposal of domestic sanitary waste would decrease from three to two, so these impacts would be **somewhat less than HHSEGS**. Because the majority of off-site flows pass through HHSEGS Solar Plant 2, impacts from 100-year flood flows and flooding for the Reduced Acreage Alternative would be **similar to the proposed HHSEGS project**. However, by avoiding storm damage impacts in the Solar Plant 1 solar field, the overall impacts of storm water damage for the Reduced Acreage Alternative would be **somewhat less than HHSEGS**.

Water Supply

The Reduced Acreage Alternative would require less operational water use for process and heliostat washing compared to the proposed HHSEGS project. Assuming installation of approximately half the total number of heliostats compared to the proposed project, operational water use could be reduced up to approximately 68 afy under this alternative. Potential impacts on the Pahrump groundwater basin and local well owners would be reduced relative to the proposed HHSEGS project. The Reduced Acreage Alternative would involve construction of the solar field that is closest to Stump Springs and the rural development south of the proposed project site. Although operational water use would be reduced under this alternative, the potential effects of increased groundwater use on local well owners and sensitive resources that are relatively close to the project site would not necessarily be reduced to half that of the proposed project. Therefore, staff concludes that potential impacts on water supply would be **somewhat less than HHSEGS**.

The groundwater basin is already in overdraft; therefore, any additional water use, no matter how little, could result in a cumulatively significant impact. If significant impacts were identified on water supply, the same conditions of certification proposed for the HHSEGS project would be recommended for this alternative, which would reduce the impacts to a less-than-significant level.

PROJECT ALTERNATIVES COMPARED TO THE PROPOSED PROJECT

The environmental effects of constructing and operating the proposed project are described in detail for each resource topic in the **Environmental Assessment** section of this staff assessment. The summary table shown in **Alternatives Appendix-3** compares the environmental impacts of the proposed project to the same or similar impacts that would be expected to occur with construction and operation of each of the

project alternatives, including the No-Project Alternative. **Alternatives Appendix-3** is included at the end of this section of the staff assessment.

ENGINEERING ASSESSMENT OF THE ALTERNATIVES

POWER PLANT EFFICIENCY AND RELIABILITY

This section evaluates the efficacy of each project alternative in providing an efficient and reliable source of power generation and compares the project alternatives using alternative technologies to the proposed project. The proposed HHSEGS project would use a solar power tower technology (SPT), which is one of a variety of solar thermal power systems called concentrating solar power (CSP). Solar technologies in California include CSP and PV technologies. The SPT with Energy Storage Alternative, the Parabolic Trough Alternative, and the Reduced Acreage Alternative in this analysis of project alternatives are CSP technologies.

The energy generation system for the proposed HHSEGS project is a solar thermal system that would use approximately 85,000 sun-tracking, flat mirrors (heliostats) to focus and concentrate the sun's rays on a solar receiver steam generator (SRSG) at the top of a 750-foot SPT that would stand in the middle of an array of heliostats. This general arrangement would be used for each of the two 250-MW systems proposed for the HHSEGS project. The SRSG absorbs the radiation energy and converts it to conductive energy suitable for making steam. The steam drives a conventional turbine that drives an electric generator.

Sandy Valley Off-site Alternative

This off-site alternative is located approximately 20 miles southeast (as the crow flies) of the HHSEGS site and has a similar topography as the HHSEGS site. The available *solar insolation*[7] is essentially the same for the two sites. Therefore, the performance of the SPT's thermal power cycle at the Sandy Valley Off-site Alternative site would not change to any measureable degree. The power cycle efficiency, power plant reliability, and the solar array area displacement (i.e., the land area requirement for each of the two solar arrays) would not change.

SPT with Energy Storage Alternative

Enhancement of the power tower technology with several hours of thermal energy storage (TES) using molten salt would provide more flexibility for incorporating the facility into the power grid by extending generation beyond the hours of available sunlight. However, incorporating TES into the design of the project would require more land due both to an increased footprint for the heliostat field to accommodate additional heliostats for the thermal storage component and the additional acreage that would be required to incorporate the storage system and tanks in the power plant areas.

[7] Sunlight intensity at a site or area is measured in units of solar insolation, which is often expressed as kilowatt hours per square meter per day (kWh/m2-day).

Solar PV Alternative

PV cells convert solar radiation directly into electrical current. Photons of light excite electrons to a higher energy state, providing the potential to induce current. Direct current (DC) from the PV cells pass through an inverter, which converts DC to alternating current suitable for transmission to the electrical power grid. PV systems can be switched off and on but do not provide ramping capability.

Using average annual daily radiation as a benchmark, **Alternatives Table 9** shows the effectiveness of different types of solar collectors for the alternative renewable technologies evaluated in this staff assessment. The table lists the total daily values for the weather station nearest the project site, represented by monthly and average annual conditions and sorted by collector type. Data are shown for a double-axis flat-plate collector typical of a power tower heliostat; the daily insolation value is 9.4 kWh/m^2-day (Category 1.3). From **Alternatives Table 9**, the incident radiation for a flat-plate fixed-tilt PV panel is 6.6 kWh/m^2-day (Category 1.1) and 9.1 for a single-axis flat-plate collector typical of a tracking PV system (Category 1.2). Using comparative ratios, the flat-plate double-axis collectors associated with the SPT project perform 42 percent better than the fixed-tilt PV panels [(9.4-6.6)/6.6 = 0.42]. The performance factor between the single-axis tracking PV panels and the representative SPT heliostats is 3.0 percent [(9.4-9.1)/9.1 = 0.03]. To conclude, the SPT project heliostats function 42 percent better than the fixed-tilt PV panels, but the performance differential between the SPT heliostats and the single-axis tracking PV panels is insignificant[8].

[8] Since 3.0 percent is less than the plus or minus 9.0 percent uncertainty in the historical measurements, the collection effectiveness of the HHSEGS heliostats and a project using single-axis tracking flat plate PV collectors is virtually equal.

Alternatives Table 9 Average Daily Solar Radiation at Daggett, California (kilowatt hours per square meter [kWh/m^2])													
Tilt	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Category 1.1: Flat-Plate Collectors with Fixed-Tilt PV Modules													
34.9°	5.3	6.0	6.8	7.4	7.4	7.4	7.2	7.3	7.3	6.8	5.2	6.6	6.6
Category 1.2: Flat-Plate Collectors with Single-Axis Tracking, North-South Axis, Tracking PV Modules													
34.9°	6.5	7.5	9.0	10.3	10.9	11.2	10.7	10.6	10.1	8.8	7.2	6.3	9.1
Category 1.3: Flat-Plate Collectors with Double-Axis Tracking, SPT Heliostats													
34.9°	6.9	7.7	9.0	10.4	11.3	12.0	11.4	10.8	10.1	9.0	7.5	6.8	9.4
Category 1.4: Single-Axis Direct Beam Concentrating Collectors, Parabolic Trough													
34.9°	5.1	5.8	6.9	8.0	8.4	8.9	8.4	8.4	8.2	7.2	5.7	5.0	7.2
Source: Weather Bureau Army Navy (WBAN), excerpts from WBAN No. 23161 for Daggett, California, which is the closest measuring station to the proposed HHSEGS site.													

Parabolic Trough Alternative

A parabolic trough system is a CSP technology where heat transfer fluid (HTF) is pumped through a tube suspended at the focal point of a curve-shaped collector. This tube absorbs the radiation energy, heating the HTF to a temperature high enough to make steam in a boiler. In turn, the steam drives a turbine and generates electricity. This system gets its name from the shape of the collector where the cross section is curved and its length is straight, giving it its characteristic trough shape.

As shown in **Alternatives Table 9**, the value for incident radiation for parabolic trough collectors is 7.2 (Category 1.4). Using the values in the table as a basis for comparison, the SPT technology uses land more effectively and collects solar energy 30 percent more efficiently than the parabolic trough technology [(9.4-7.2)/7.2 = 0.30].

Note that the comparison of ideal collector performance (see **Alternatives Table 9**) is a very simple measurement using side-by-side comparisons of the different solar technologies. Various site limitations could affect the ability of a project site (e.g., the HHSEGS site) to be developed with an alternative renewable technology. The topography of an area could limit the development potential of a site and/or ground slope needed to receive maximum solar energy by the collectors. Requirements for the geometric orientation of a collector array could dictate the configuration of a project site. Variations in available solar insolation could affect actual system performance in a particular area.

Reduced Acreage Alternative

The Reduced Acreage Alternative would use the same solar thermal system as described for the proposed project. A total of approximately 85,000 sun-tracking, heliostats would focus and concentrate the sun's rays on a SRSG at the top of a 750-foot SPT that would stand in the middle of an array of heliostats. This general arrangement would be used for the 250-MW system shown in **Alternatives Figure 10**. This alternative would have a total energy capacity of approximately 250 MWs; the solar field and common area for this alternative would use a total of approximately 1,514 acres at the proposed HHSEGS site. The technology would be the same for the one 250-MW solar plant depicted as Solar Plant 2 under the proposed project. The power cycle efficiency, power plant reliability, and the solar array area displacement (i.e., the land area requirement for the one solar array) would not change compared to the proposed project.

Conclusion

The comparison of ideal collector performance shown in **Alternatives Table 9** is a simple measurement using side-by-side comparisons of the alternative solar technologies. Various site limitations would affect actual system performance.

The SPT system proposed for HHSEGS compares equally with the conditions where the facility is relocated or enhanced using TES. Although TES increases operational flexibility, it does not influence the performance of the heliostats for an SPT project with or without energy storage capabilities. The representative SPT project compares favorably to parabolic trough because of the tracking limitations of trough collectors. Lastly, the SPT heliostats perform better than the fixed-tilt PV system, and equally as well as the tracking PV system. Other PV performance limitations, including its "on-off" intermittency when utilized on the electric power grid, make SPT a more attractive technology from a project efficiency and reliability perspective.

TRANSMISSION SYSTEM ENGINEERING

Compared to the proposed HHSEGS project, the Sandy Valley Off-site Alternative site is closer to the existing Pahrump-Bob Tap 230-kV transmission line, which could be used to interconnect this alternative to the Valley Electric Association (VEA) system. Under this alternative, the required generator tie-line would be approximately 3 miles shorter than for the proposed HHSEGS project. A fewer number of transmission line poles would be required, which would reduce the total acreage of ground disturbance from construction of the generator tie-line and power poles.

As discussed under the subsection, "Transmission Line Safety and Nuisance," for the Sandy Valley Off-site Alternative, the potential alignment for the transmission line would exit the east side of the alternative site study area in California to generally parallel Quartz Avenue through Sandy Valley, Nevada, before turning northeast to parallel Kingston Road east of Sandy Valley. Staff observes that no studies have been done on the potential feasibility of constructing a 230-kV transmission line along the described route.

No significant impacts are identified related to transmission system engineering (TSE) under the proposed project. The downstream transmission system impacts under the Sandy Valley Off-site Alternative would be the **same as described for the proposed HHSEGS site**. This alternative would comply with applicable LORS pertaining to TSE. The same or similar conditions of certification identified in the TSE analysis for the proposed project would apply to this alternative.

None of the project alternatives using alternative technologies would cause greater impacts than those described for the proposed HHSEGS project. The Reduced Acreage Alternative could reduce potential impacts on the VEA system compared to the proposed project; this impact would be **slightly less than or similar to the proposed project**. The alternatives, including the alternative technologies, would generate electricity at the same power output and would interconnect to the same Crazy Eyes Tap substation. Power would be distributed to the same VEA transmission system. Therefore, the downstream transmission system impacts from the alternatives using alternative technologies would be **similar to the impacts of the proposed HHSEGS project**.

ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The State CEQA Guidelines call for identification of an environmentally superior alternative and specify that "[i]f the environmentally superior alternative is the 'no project' alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives" (Cal. Code Regs., tit. 14, § 15126.6[e][2]).

The project alternatives that are included in staff's analysis are those that could potentially attain most of the basic objectives of the project while avoiding or substantially lessening the significant impacts of the proposed project.

From the perspective of purely minimizing effects on the existing environment, the No-Project Alternative would be the superior alternative because it would result in no changes in the existing condition. However, the No-Project Alternative would not meet the key project objective of constructing and operating a renewable electrical generation facility resulting in sales of renewable energy consistent with the needs of California utility companies.

The continuation of existing conditions at the proposed HHSEGS site could result in varying degrees of changes to resource conditions for Biological Resources, Cultural Resources, Soil and Surface Water, and Water Supply; all changes to resource conditions under the No-Project Alternative would be less than those identified for the proposed project and are considered less than significant compared to the proposed project. Because no construction is proposed under the No-Project Alternative, no further analysis of these predicted changes to resource conditions is required. No significant differences between the project alternatives and the proposed project are identified for these environmental resources: Public Health, Socioeconomics, and Transmission Line Safety and Nuisance. For these resources, all impacts across all of the project alternatives could be reduced to less than significant with implementation of

mitigation measures that would be the same as or similar to the conditions of certification recommended for the proposed project.

Although a greater impact on Socioeconomic Resources is identified for the Sandy Valley Off-site Alternative due to the potential displacement of rural residences, acquisition of properties would include appropriate compensation to the landowners displaced by this alternative; therefore, this impact would be less than significant.

Staff identifies significant impacts on Land Use related to inconsistencies with adopted plans and policies for all project alternatives. For the Sandy Valley Off-site Alternative, staff identifies a significant impact on agricultural resources due to the conversion of several hundred acres of agricultural land to a non-agricultural use (discussed below); this impact would be reduced to less than significant with implementation of appropriate mitigation measures.

For potential impacts on Biological Resources, staff developed a qualitative comparison of the project alternatives to the proposed project that considers the severity of impacts, the extent to which impacts could be reduced with implementation of mitigation measures, and the nature of the affected resource. Some resources, such as threatened and endangered species, are more vulnerable to perturbation and recover more slowly; therefore, impacts on those resources are weighted more heavily than impacts on common wildlife. The discussions below include staff's conclusions for impacts on Biological Resources.

SUMMARY CONCLUSIONS FOR THE PROJECT ALTERNATIVES

SPT with Energy Storage Alternative

Of the project alternatives, the SPT with Energy Storage Alternative is most similar to the proposed project; and for most environmental resources, comparative impacts are described as, "same as," "similar to," or "somewhat greater than," the proposed project. For impacts that generally correlate to the extent of the site footprint, potentially greater impacts are identified for this alternative because of the possible need to expand the site boundary for the molten-salt storage tanks and additional heliostats. Staff concludes that potential impacts on groundwater resources could increase proportionally with increased water usage under this alternative, concluding that impacts related to groundwater depletion would be "somewhat greater than HHSEGS." Like the proposed project, mitigation measures would be required to reduce potential groundwater impacts to less than significant. Staff concludes that impacts on special-status plant species and desert tortoise and other special-status terrestrial species would be "similar to or somewhat greater than HHSEGS." Impacts on avian species would be "similar to or somewhat greater than HHSEGS," and no feasible mitigation measures could reduce this impact to less than significant.

No significant impact identified for the proposed project would be avoided or substantially lessened under the SPT with Energy Storage Alternative, and assuming that minimizing direct environmental effects is the priority for this alternatives analysis, staff concludes that this alternative would not be the environmentally superior alternative. As discussed above, the SPT with Energy Storage Alternative could

potentially attain most of the basic project objectives, although it is unknown how changing the proposed project to add thermal energy storage would affect project viability.

Sandy Valley Off-site Alternative

For many environmental resources, staff concludes that impacts for the Sandy Valley Off-site Alternative would be "similar to HHSEGS." Because several hundred acres at the Sandy Valley Off-site Alternative study area have been disturbed by historical agricultural uses, some of the impacts on Biological Resources would be "much less than HHSEGS." However, because the technology of this alternative would be the same, impacts on avian species from exposure to concentrated solar flux in the airspace over the heliostat field and potential collisions with the solar power towers and other project structures would be "similar to or somewhat greater than HHSEGS" and are considered significant and unavoidable.

Cultural Resources staff has preliminarily determined that potential impacts on significant on-site prehistoric and historical archaeological sites would be, "somewhat greater than HHSEGS," under this alternative. Further analysis of the Sandy Valley alternative site and study area would be needed to verify that conclusion. None of the cultural resources impacts identified for the proposed project could be avoided or substantially lessened under this alternative. Staff has determined that the potential for this alternative to visually degrade significant ethnographic resources would be "similar to HHSEGS," and no feasible mitigation measures would reduce these impacts to less than significant.

The Sandy Valley Off-site Alternative would convert approximately 750 acres of agricultural land to a non-agricultural use. This conversion of agricultural land would be a significant impact, and it is an impact that would not occur under the proposed project. Mitigation measures would be required to reduce the impact to less than significant. Staff identified the potential for uses of herbicides or pesticides to have contaminated soils at the Sandy Valley site and determined that the impact on human health and the environment would be "somewhat greater than HHSEGS." Implementation of remediation that could be required to address any soils contamination would reduce the impact to less than significant.

Under this alternative, impacts on special-status plants, habitats, waters of the U.S., and waters of the state would be "much less than at the proposed HHSEGS site." Like the proposed project, mitigation measures would be required to reduce these significant impacts to less than significant. No other environmental impacts would be substantially lessened with construction and operation of the Sandy Valley Off-site Alternative. Staff concludes that the Sandy Valley Off-site Alternative would not be the environmentally superior alternative.

The Sandy Valley Off-site Alternative could potentially satisfy many of the project objectives. The feasibility of obtaining site control and use within a reasonable period of time is unclear, and achieving this project objective would be critical to the viability of this alternative.

Parabolic Trough Alternative

For the environmental topics of Air Quality, Land Use, Noise and Vibration, Waste Management, and Water Supply, staff concludes that comparative impacts would be "similar to HHSEGS" or "same as HHSEGS" under the Parabolic Trough Alternative. In general, staff concludes that without the solar towers that would be constructed under the proposed project, some impacts on Visual Resources, Geology and Paleontology, Traffic and Transportation, and Cultural Resources would be less than HHSEGS, in varying degrees, under this alternative. Impacts on avian species from the effects of concentrated solar flux above the solar collector arrays would not occur under the Parabolic Trough Alternative. Staff concludes that impacts on special-status plants, waters of the state and waters of the U.S., and special-status wildlife species would be the "same as HHSEGS." For potentially significant impacts on avian species from collisions with the solar collectors and other equipment, staff concludes that the impacts would be "unknown" compared to HHSEGS even though the absence of the power towers under the Parabolic Trough Alternative would eliminate the potential for avian species to collide with those extremely tall structures.

Comparative impacts on Visual Resources under this alternative are described as "similar to" or "somewhat less than HHSEGS." Under this alternative, staff concludes that the impact addressing the project's potential to create a new source of substantial light or glare during project construction (considered "significant and unavoidable" under the proposed project) would be reduced to "potentially significant" under this alternative. This impact could potentially be reduced to less than significant with implementation of appropriate mitigation measures. Staff concludes that the net effect of this alternative on visual resources is considered "significant and unavoidable" due to the high reflectivity of the parabolic mirrors; no feasible mitigation measures could fully reduce the net effect to a less-than-significant level.

Given that this alternative would not include power towers topped by SRSGs, Traffic and Transportation staff concludes that the potential for glint and glare to cause a distinct visual distraction effect from an operator control perspective (i.e., vehicle motorists and aircraft pilots) would be "less than HHSEGS" under the Parabolic Trough Alternative. Like the proposed project, mitigation measures would be recommended to reduce the potential for glint and glare from the parabolic mirrors to create a distinct visual distraction effect to less than significant.

Staff concludes that the Parabolic Trough Alternative would be much less susceptible to the effects of strong seismic shaking due to the elimination of the SPTs. This technology would cause fewer potential impacts on paleontological resources, and staff concludes that the net effect of potential impacts on geological and paleontological resources would be "less than HHSEGS." Like the proposed project, significant or potentially significant impacts on these resources would be reduced to less than significant with implementation of appropriate mitigation measures.

Cultural Resources staff has determined that the Parabolic Trough Alternative would reduce impacts on historical resources compared to the proposed project and that the net effect of this alternative would be "much less than HHSEGS." Of the impacts

identified by staff, two impacts addressing resources *beyond* the site that are considered “significant and unavoidable” under the proposed project would be reduced to “potentially significant” under this alternative (see **Alternatives Table 7**); the resources are the *Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape* and the *Old Spanish Trail–Mormon Road Northern Corridor*. (Please see the **Cultural Resources** section of this staff assessment for discussions of these resources.) These two impacts could potentially be reduced to less than significant with implementation of appropriate compensatory mitigation measures, which would likely include delivery of programs that would address three broad objectives in relation to the affected historical resources: research, interpretation, and preservation. Preservation could refer to preserving particular places or portions of places on the ground, as well as material remains from such places or portions thereof. Preservation could also refer to retaining information that would provide the content needed to interpret the value of important resources.

For impacts on Soil and Surface Water, staff concludes that some impacts would be “greater than HHSEGS” while others would be “less than HHSEGS.” Staff concludes that increased earth moving during project construction would cause a “much greater” soil erosion impact. Engineered storm water management would reduce potential impacts from on-site and off-site flooding compared to the proposed project; however, potential impacts on the diversion channels from storm damage would be “greater than HHSEGS.” All impacts on soil and surface water resources would be reduced to less than significant with implementation of appropriate mitigation measures. The impact conclusions for potential impacts on soil and surface water resources would not change under this alternative, and staff concludes that the net effect of the Parabolic Trough Alternative on soil and surface water resources would be similar to the net effect of the proposed project.

Because the Parabolic Trough Alternative does not use solar power towers to collect solar radiation, this technology would not impact avian species from the effects of exposure to concentrated solar flux in the airspace over the solar collector array areas. Similar to the proposed project, potentially significant impacts on avian species could stem from the disruptive effects of glint and glare and potential collisions with project structures, including the parabolic mirrors. Without further data, staff has determined that the net effect of potential impacts on avian species related to glare and collisions with structures under this alternative cannot be reasonably compared to the proposed project. Like the proposed project, impacts related to habitat loss could be reduced to less than significant with implementation of appropriate mitigation measures. However, no evidence exists demonstrating that impacts on avian species from collisions with the solar collectors and other equipment associated with large-scale renewable energy facilities could be reduced to below a level of significance, and these impacts could remain significant and unavoidable.

Due to the use of combustible substances and the increased fire risk associated with the Parabolic Trough Alternative, staff concludes that impacts on fire protection services and facilities would be “much greater than HHSEGS.” Hazardous materials impacts are

considered to be “somewhat greater than HHSEGS.” Implementation of appropriate mitigation measures would reduce these impacts to less than significant.

Staff concludes that the Parabolic Trough Alternative would not substantially lessen impacts on Water Supply or Visual Resources. Like the proposed project, impacts on Geology and Paleontology and Traffic and Transportation are “significant” or “potentially significant,” requiring mitigation measures to reduce the impacts to less than significant. Most of the impacts on Biological Resources would be the “same as HHSEGS.” This alternative would cause greater impacts related to Fire Protection and Hazardous Materials. The overall effect of this alternative on Cultural Resources would be “much less than HHSEGS,” and staff considers this to be the primary benefit of this alternative compared to the proposed project. If substantially reducing the two direct environmental effects on Cultural Resources is a critical factor, then the Parabolic Trough Alternative would be somewhat superior to the proposed project.

Although the Parabolic Trough Alternative could potentially attain many of the basic project objectives, it is unknown how changing the project technology would affect project viability.

Reduced Acreage Alternative

For most environmental resources, comparative impacts under this alternative are described as, “similar to,” “somewhat less than,” or “much less than HHSEGS.” Based on the distribution of particular species and habitats across the proposed project site, staff concludes that impacts on special-status plants, habitats, waters of the U.S., and waters of the state would be “much less than HHSEGS.” Staff concludes that impacts on avian species from potential collisions with project structures and exposure to solar flux would be reduced, and the comparative impact conclusion is “less than HHSEGS.” However, no feasible mitigation measures could reduce the impacts on avian species related to glint and glare and collisions with the solar tower to less than significant, and like the proposed project, this impact would remain significant and unavoidable. Other than reducing the potential extent of impacts on Biological Resources, no other environmental impacts would be substantially lessened with construction and operation of the Sandy Valley Off-site Alternative.

Reducing the project site and number of structures by approximately one-half would cause this alternative as a whole to be less susceptible to the effects of strong seismic shaking, and staff concludes that impacts on geological resources would be “much less than HHSEGS.” Like the proposed project, all significant or potentially significant impacts on geological and paleontological resources would be reduced to less than significant with implementation of appropriate mitigation measures.

Staff concludes that impacts on Visual Resources would be “similar to HHSEGS,” and no feasible mitigation measures could reduce these impacts to less than significant; like the proposed project, visual resources impacts would remain significant and unavoidable.

Comparative impacts on Cultural Resources under the Reduced Acreage Alternative are described as “somewhat less than HHSEGS.” Like the proposed project, no feasible

mitigation measures would reduce the impacts described as “significant and unavoidable” to less than significant.

The overall effect of the Reduced Acreage Alternative on Biological Resources would be “much less than HHSEGS,” and staff considers this to be the primary benefit of this alternative compared to the proposed project. Impacts on avian species from potential collisions with the power towers and exposure to solar flux would be reduced; however, these impacts would remain significant and unavoidable. If reducing the overall extent of impacts on special-status species, including avian species; habitats; waters of the U.S., and waters of the state is the critical factor, then the Reduced Acreage Alternative would be somewhat superior to the proposed project.

Although the Reduced Acreage Alternative could potentially attain many of the basic project objectives, it is unknown how eliminating the northern solar plant would affect project viability.

Solar PV Alternative

For the environmental topics of Visual Resources, Fire Protection, Geology and Paleontology, and Noise and Vibration, staff concludes that most comparative impacts would be “less than HHSEGS” or “much less than HHSEGS” under the Solar PV Alternative. Like the proposed project, most of the impact conclusions under these topics are identified as “significant” or “potentially significant,” requiring mitigation measures to reduce the impacts to less than significant.

Given the lower operational water use for the Solar PV Alternative (estimated up to approximately 12 afy compared to approximately 140 afy for the proposed project), potential impacts on Water Supply would be “somewhat less than HHSEGS.” Because the groundwater basin is already in overdraft, any additional water use, no matter how little, could result in a cumulatively significant impact on groundwater resources. Like the proposed project, impacts on Water Supply are considered “potentially significant” under this alternative. Mitigation measures similar to those recommended for the proposed project would be implemented to reduce the impact on Water Supply to less than significant, if such an impact occurred.

Use of fossil fuel-fired energy generation is not required under this alternative, and for potential impacts on Air Quality, staff concludes that operational impacts related to criteria pollutant emissions would be “less than HHSEGS.” Like the proposed project, construction and operations emissions would be reduced to less than significant with implementation of appropriate mitigation measures.

Impacts related to Hazardous Materials and Waste Management would be “similar to” or “somewhat greater than HHSEGS.” All associated impacts would be reduced to less than significant with implementation of mitigation measures to protect human health and the environment.

For impacts on Soil and Surface Water resources, staff concludes that some impacts would be less than HHSEGS, in varying degrees. In part because of the decrease in

frequency for washing of PV panels compared to what would be required to maintain the heliostats under the proposed project, this alternative would create less dust overall from washer vehicles driving on the dirt roads, and impacts related to soil erosion during project operations would be “less than HHSEGS.” Depending on the PV module technology, the potential impact on water quality from storm damage would be “somewhat greater than HHSEGS.” Implementation of appropriate mitigation measures would reduce the impact to less than significant. Staff concludes that other impacts on Soil and Surface Water resources, including the potential for on-site and off-site flooding, would be “similar to HHSEGS.” Staff concludes that the net effect of the Solar PV Alternative on soil and surface water resources would be similar to the net effect of the proposed project.

Staff concludes that the Solar PV Alternative would reduce impacts on Visual Resources compared to the proposed project, and that the effects of this alternative would be “less than HHSEGS” for construction-related impacts and “much less than HHSEGS” for project operations impacts. Impacts identified by staff as “significant and unavoidable” under the proposed project would be reduced to “significant” or “potentially significant” under this alternative (see **Alternatives Table 6**). These impacts would be reduced to less than significant with implementation of appropriate mitigation measures. Given that the Solar PV Alternative would not include power towers topped by SRSGs or highly reflective solar collectors, Traffic and Transportation staff concludes that the potential for glint and glare to cause a distinct visual distraction effect from an operator control perspective would be “much less than HHSEGS,” and the impact conclusion is less than significant.

Biological Resources staff concludes that significant impacts on special-status plants, wildlife, waters of the U.S. and waters of the state could be reduced to less than significant with implementation of appropriate mitigation measures. The real benefit of the Solar PV Alternative relates to the extent of identified significant impacts on avian species, the only biological resource for which no feasible mitigation measures exist to reduce the impacts by any known measure. Large-scale solar PV installations can cause impacts on avian species from potential collisions with the PV panels, and the reflection of the sky in the solar panels may mimic the appearance of water, thus serving as an attractant to birds. While the proposed HHSEGS project has the potential to impact birds from collisions with project structures, it would also increase the potential for significant impacts on avian species compared to the Solar PV Alternative; collisions with the 750-foot-tall towers and potentially fatal exposure to concentrated solar flux in the airspace over the heliostat field would not occur under this alternative. No feasible mitigation measures are available to reduce the extent or severity of these impacts on avian species.

A 2009 technical memorandum on a review of potential impacts of solar array developments on biological resources states that “non-reflective flat plate panels are preferred over reflective technologies, such as CSP, for sites with burrowing owls. It is recommended that the impact of solar panel reflective properties be part of the procurement selection criteria to minimize impacts on avian wildlife” (City of San Jose 2009). Staff concludes that the potential benefit to burrowing owls from the Solar PV

Alternative compared to the proposed project could benefit all bird species that would likely be impacted by the proposed project.

The reduced groundwater pumping that would be required under the Solar PV Alternative compared to the proposed project would lessen potential impacts on groundwater dependent vegetation and associated plants and wildlife. The infrequent washing of PV panels under this alternative would reduce on-site disturbance. With driving over the site reduced under this alternative, dust generation and potential impacts on wildlife at the site would decrease. Although conditions of certification are included in the **Air Quality** section requiring staff's approval of the dust suppression product that would be used at the proposed project site (**AQ-SC3** and **AQ-SC7**), the use of any such product would likely be reduced under the Solar PV Alternative, which would increase the benefit to wildlife to some extent. The reduced frequency of driving on the site under this alternative during project operations could also decrease the potential for weed growth at the site.

At the Ivanpah Solar Electric Generating System construction site, special-status species and/or fully protected species such as burrowing owl, kit fox, and desert tortoise continue to be discovered on the site, and move on and off the site, even though construction began in late 2010, and the site is enclosed by a perimeter fence (with desert tortoise exclusionary fencing attached). This would be expected at any large solar development, particularly where vegetation is allowed to remain on-site. Staff concludes that the potential for wildlife to be crushed, buried, or injured during maintenance work, including washing of solar collectors, would be reduced under the Solar PV Alternative.

For potential impacts on Cultural Resources, staff concludes that the Solar PV Alternative would pose far less of a visual intrusion on off-site historical resources compared to the project alternatives that would duplicate the vertical profile of the proposed HHSEGS project. The reduced vertical profile of the Solar PV Alternative and the relatively non-reflective PV panels would cause lesser impacts on the broad, landscape-scale resources that are of concern, and the PV arrays would be much less visually intrusive than the proposed power towers where the array was visible. Of the impacts identified by staff, two impacts addressing resources *beyond* the site that are considered "significant and unavoidable" under the proposed project would be reduced to "potentially significant" under the Solar PV Alternative, and these impacts would be reduced to a greater extent compared to the Parabolic Trough Alternative (see **Alternatives Tables 6 and 7**); the resources are the *Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape* and the *Old Spanish Trail–Mormon Road Northern Corridor*. Cultural resources staff concludes that of all the project alternatives, the Solar PV Alternative would offer the potential to develop mitigation measures that would go furthest toward reducing impacts on historical resources compared to the proposed project.

The primary benefits of the Solar PV Alternative compared to the proposed project are greatly reduced impacts on Visual Resources, Biological Resources, and Cultural Resources. The Solar PV Alternative would go furthest toward minimizing and avoiding avian impacts; this conclusion is based on the possibility that the Solar PV Alternative

could cause somewhat less potential for collision impacts and would eliminate the potential for mortality and morbidity from exposure to concentrated solar flux. If substantially reducing the extent and severity of direct environmental effects is the priority, then the Solar PV Alternative would be environmentally superior to the proposed project.

Although the Solar PV Alternative could potentially attain many of the basic project objectives, it is unknown how changing the project technology would affect project viability.

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APPENDIX ALTERNATIVES-1: STAFF CONTRIBUTORS TO THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This appendix lists staff responsible for specific technical analyses in the **Alternatives** section of this staff assessment. Staff names are listed with their area of technical expertise.

Technical Area	Staff
Air Quality	Jacquelyn Leyva
Biological Resources	Carol Watson Carolyn Chainey-Davis
Fire Protection	Geoff Lesh, P.E.
Geology and Paleontology	Casey W. Weaver, CEG
Hazardous Materials Management	Geoff Lesh, P.E.
Land Use	Christina Snow
Noise and Vibration	Shahab Khoshmashrab, P.E.
Power Plant Efficiency and Reliability	Ed Brady, P.E.
Public Health	Huei-An (Ann) Chu, Ph.D.
Socioeconomic Resources	Steven Kerr
Traffic and Transportation	Candace Hill
Transmission Line Safety and Nuisance	Obed Odoemelam, Ph.D.
Transmission System Engineering	Sudath Edirishuriya
Visual Resources	Melissa Mourkas, ASLA
Waste Management	Ellen Townsend-Hough
Soil and Surface Water	Marylou Taylor, P.E.
Water Supply	Mike Conway
Grid-Level Integration Issues	Michael R. Jaske, Ph.D. Mark Hesters

APPENDIX ALTERNATIVES-2: OTHER RENEWABLE ENERGY TECHNOLOGIES

INTRODUCTION

This appendix briefly discusses several renewable energy technologies that are not included in the review of potentially feasible alternatives to the proposed project in the **Alternatives** section of the staff assessment.

The renewable technologies discussed in this appendix include solar and non-solar technologies:

- Concentrated photovoltaic technology
- Dish/engine technology
- Linear Fresnel technology
- Solid Oxide Fuel Cells (e.g., Bloom's Energy Server™)
- Wind
- Geothermal
- Biomass
- Small hydroelectric
- Wave and tidal

These renewable energy technologies are not considered alternatives to the proposed project for several reasons; some of them represent different projects that could be proposed and implemented by various applicants, public utilities, or lead agencies in parts of the state or environments that are far removed from the location of the proposed project. New technologies such as those using solid oxide fuel cells are being deployed to serve on-site load but do not yet have the infrastructure and public policy support needed to begin serving load on the *utility-side of the meter* (also referred to as system-side generation).

A project proposed to use one of the technologies listed above could be required to comply with the California Environmental Quality Act (CEQA) and other applicable environmental laws and regulations, which could include preparation of an alternatives analysis pursuant to Section 15126.6 of the State CEQA Guidelines. Rather than being considered alternatives to the proposed project, specific projects proposed to use one of the technologies listed above could be subject to a full analysis of its potential environmental effects, in accordance with the requirements of CEQA. These other renewable technologies are further discussed below. Brief discussions are provided describing why the technologies were not evaluated as potentially feasible alternatives to the proposed project.

RENEWABLE SOLAR TECHNOLOGIES

In 2010, solar generation provided 3 percent of in-state renewable generation (0.4 percent of total in-state energy generation) (California Energy Commission 2010). Renewable solar technologies in California fall into two general categories—concentrating solar power (CSP) and photovoltaic (PV). CSP technologies are those that concentrate the sun's energy to produce heat. The heat drives either a steam turbine or an external heat engine to produce electricity. In PV technologies, the photons in sunlight are converted directly to electricity. Distributed energy resources include various fuels and technologies; the **Alternatives** section of this staff assessment includes a discussion and analysis of the distributed generation PV category of renewable energy.

CONCENTRATED PHOTOVOLTAIC TECHNOLOGY

Overview

Concentrated photovoltaic (CPV) systems have an optical component, which *concentrates* significant amounts of sunlight onto *multi-junction* solar cells (EnergyTrend 2011). These special cells have higher energy conversion efficiency, potentially greater than 40 percent, but are typically more expensive than high-efficiency silicon solar cells. The system's optical unit functions like a telescope, concentrating sunlight on solar modules mounted on a tracking system that automatically tracks the position of the sun from sunrise to sunset. Concentration allows for a decreased cell area for these special cells relative to conventional photovoltaic cells. CPV has the ability to ramp to gigawatts of production very rapidly (CPV Consortium 2012). While CPV systems have a much higher efficiency than traditional silicon-based PV, this is offset by their ability to only use direct sunlight because of their concentrating component. Clouds and overcast conditions create diffused light that essentially cannot be concentrated.

California Energy Commission (Energy Commission) staff researched the availability of CPV projects in the United States (U.S.) through the Solar Energy Industries Association (SEIA), a national trade organization of the U.S. solar energy industry, and the availability of CPV projects internationally through the various companies that manufacture and develop this technology. CPV technology front-runners are Amonix, Inc. (Amonix 7700 CPV Solar Power Generator); Soitec (Concentrix™); and SolFocus, Inc. (SF-1136SX Concentrator Photovoltaic System). Other manufacturers of CPV technology include SunPower Corporation (SunPower® C7 Tracker); Entech Solar, Inc. (SolarVolt™); and GreenVolts, Inc., a previous recipient of a grant from the Energy Commission's Public Interest Energy Research Program.

GreenVolts' CPV system has a total installed capacity of 0.5 megawatt (MW) at six locations in California and Arizona. Several sites are also in development with capacities ranging from 200 kilowatts (kWs) to 1 MW; Pacific Gas & Electric Company (PG&E) has a 2.5-MW power plant near Tracy, California, representing the first power purchase agreement to be signed by PG&E using this technology (Energy Commission 2011a). CPV projects in California, Arizona, Colorado, and New Mexico, both operational and under development, range from 1 MW, 5 megawatts (MWs), 30 MWs and peaking at 50 MWs.

Imperial Solar Energy Center West in Imperial County has been approved for development with a capacity of up to 150 MWs (Tenaska Solar Ventures 2012). This project has been approved with the flexibility of using either CPV or PV technology.

Companies with international development of CPV projects are SolFocus and Amonix. SolFocus has developed two pilot projects in Chile (8.8 kWs each), a pilot project in South Africa (8.4 kWs), two projects in Spain (200 kWs, 300 kWs), one project in Italy (8.4 kWs), a pilot project in Malta (8.4 kWs), a combined 1.28 MWs for multiple customers in Greece, one project in Saudi Arabia (132 kWs), one project in Malaysia (8.4 kWs), and one project in Australia (235 kWs) (SolFocus 2012). SolFocus announced on March 29, 2012, its plans to launch a 450-MW CPV plant in Baja California, Mexico, with construction proceeding in 50-MW sections. Construction is anticipated to begin in late 2012 and be operational by the end of 2013. Amonix has developed two projects in Spain (950 kWs and 7.8 MWs), both of which are operational (Amonix 2012).

With the exception of Tenaska Solar Venture's Imperial Solar Energy Center West, and the 450-MW plant in Mexico, each of these technology front-runners has small-scale CPV facilities but nothing at the utility scale (50 MWs or greater). Scaling technology to the utility-scale level involves the ability of the technology to function and generate energy at a larger scale, but it also includes other cost considerations. Developing CPV technology at the utility scale internationally may have different cost considerations from development in the U.S.

Decision to Eliminate the Technology from the Alternatives Analysis

Staff's decision to eliminate the technology from the alternatives analysis is generally based on the state of the technology. Based on staff's research, CPV technology is not yet proven at the utility scale. CPV has been proven at the small scale at some specific locations while projected technology development shows potential to make it a utility-scale solar technology. While CPV systems show promise, they have rarely been implemented at a larger scale (50 MWs or greater). Scaling up to utility scale presents different technical challenges and cost issues.

CONCENTRATING SOLAR POWER

Overview

According to the National Renewable Energy Laboratory (NREL) the three main types of CSP systems are linear concentrator, dish/engine, and power tower systems (NREL 2009). The proposed project uses solar power tower technology; therefore, the technology is not described in this appendix. Counties with the greatest potential for CSP facilities include Kern, San Bernardino, Riverside, and Imperial (Energy Commission 2011b).

Energy Commission staff researched the availability of dish/engine and linear Fresnel projects in the U.S. through SEIA, and internationally through the various companies that develop and manufacture this technology.

Dish/Engine Systems

A dish/engine system uses the surface of a mirrored dish to direct and concentrate sunlight onto a thermal receiver, which absorbs and collects the heat and transfers it to the engine generator (NREL 2009). The most common type of heat engine in dish/engine systems is known as the Stirling engine. This system uses the fluid heated by the receiver to move pistons and create mechanical power. The mechanical power is used to run a generator or alternator to produce electricity. Prior to September 2011, there were three dish/engine technology front-runners; Stirling Energy Systems, Wizard Power (Big Dish), and Infinia Corporation (PowerDish). In September 2011, Stirling Energy Systems filed for Chapter 7 bankruptcy. Research shows only a couple of dish/engine projects under development in the U.S., including a 10-MW project in Arizona and a 145-MW project in Colorado. At the international level, construction of Wizard Power's Big Dish 40-MW demonstration project in Australia is likely to begin in May 2013 and will be completed in about 30 months (CSP Today 2012). Infinia Corporation's largest deployment of its Power Dish technology is a 10-MW project in India, which is scheduled to be installed and commissioned by the end of 2012 (Recharge 2011).

Linear Fresnel Systems

The linear Fresnel system is one of two types of linear concentrator systems. The other is parabolic trough. The staff assessment for the proposed HHSEGS project includes an analysis of a parabolic trough alternative; therefore, the technology is not described in this appendix. The linear Fresnel system uses several mirrors to collect and focus the sun's energy on one receiver tube positioned above the mirrors (NREL 2009). The linear Fresnel system uses flat mirrors, allowing more reflectors to be placed in the same amount of space. Flat mirrors cost less than parabolic mirrors. The sunlight heats a fluid flowing through the tubes that is then used to boil water in a conventional steam-turbine generator to produce electricity. Novatec Solar, AREVA Solar (Ausra), and Solar Power Group are some of the developers of linear Fresnel technology. A 5-MW linear Fresnel power plant is operating in California. Novatec Solar has developed a 30-MW linear Fresnel power plant in Spain that began operating in January 2012. In spring 2010, a 1.4-MW plant began operating in Spain. A 9.3-MW (peak thermal output) plant in Liddell, Australia is planned for completion in mid-2012 (Cogeneration & On-Site Power Production 2012).

In October 2007, an Application for Certification (AFC) was submitted to the Energy Commission for the Carrizo Energy Solar Farm, a 177-MW solar thermal project on the Carrizo Plain that was proposed using approximately 195 compact linear Fresnel reflector (CLFR) solar concentrating lines (07-AFC-8). Each line was planned with ten rows of reflectors; the slightly curved linear solar reflectors would have concentrated the sun's energy on pipes in 56-foot-tall receiver structures. In the November 2008 preliminary staff assessment (PSA), staff identified impacts on multiple protected wildlife species and blockage or impairment of wildlife corridors. When the PSA was published, staff had not yet determined whether impacts on biological and visual resources could have been mitigated to less-than-significant levels. The cumulative impact analysis addressed the potential for the project to contribute to significant cumulative impacts on biological and visual resources. Impacts related to traffic and transportation were

determined to be significant, and no feasible mitigation measures were identified to reduce impacts to below a level of significance. Draft portions of the final staff assessment were published between June and August 2009. In November 2009, the applicant withdrew the AFC and the project was terminated.

Decision to Eliminate the Technology from the Alternatives Analysis

Staff's decision to eliminate the technology from the alternatives analysis is generally based on technological and practical limitations. Based on staff's research, the dish/engine technology is not yet successfully demonstrated at a large scale (50 MWs or greater). The linear Fresnel technology has not yet been proven at the utility scale.

NON-SOLAR RENEWABLE POWER GENERATION

SOLID OXIDE FUEL CELLS

Overview

A solid oxide fuel cell (SOFC) is an electrochemical conversion device that produces electricity directly from oxidizing a fuel. Fuel cells are characterized by their *electrolyte* material[1]; the SOFC has a solid oxide or ceramic electrolyte. Advantages of the SOFC include high efficiency, reliability, and durability. The largest disadvantage is the high operating temperature, which results in longer start-up times and mechanical and chemical compatibility issues (Wikipedia 2012, IEEE Spectrum Magazine 2012).

Bloom Energy is a company headquartered in Sunnyvale, California. Bloom's Energy Server™ is a new class of distributed power generation using SOFC technology to generate electricity through an electro-chemical process (Bloom Energy 2012). Bloom Energy's fuel cells can operate on natural gas or renewable fuels (e.g., biogas[2]). Each fuel cell can produce about 25 watts of power, and each energy server consists of thousands of fuel cells enabling each energy server to provide 200 kWs of power. Electricity is typically produced at the customer site. According to information on the Bloom Energy website, 200 kWs of power meets the baseload needs of 160 average homes or an office building, operates day and night, and requires approximately the area of a standard parking space. The systems are scalable and modular, allowing more power to be added with additional energy servers. Bloom Energy is installing Bloom's Energy Server™ technology at many sites, including The Coca Cola Company (500 kWs[3] in California), Google (400 kWs in California), Bank of America (500 kWs in California), FedEx Express (500 kWs in California), California Institute of Technology (2 MWs), eBay (500 kWs in California and 6 MWs in Utah), Washington Gas (200 kWs in Virginia), and Fireman's Fund (600 kWs in California) (Bloom Energy 2012). Almost all of Bloom Energy's installations in California are on the customer side of the meter.

[1] In basic terms, an electrolyte is a solution or molten substance that conducts electricity.
[2] Certain businesses produce organic waste that can be repurposed into a clean, renewable fuel source called biogas. When biogas is conditioned to pipeline-quality natural gas, it becomes biomethane. Businesses that tend to have their own supplies of the waste needed to make biomethane include dairies, food processing companies, and wastewater treatment plants.
[3] 500 kWs is equal to 0.5 MW.

The 6-MW Bloom Energy SOFC system at eBay will power an expanded data center in Utah and is described as the largest stationary fuel cell bank ever installed in a non-utility setting. Project completion is anticipated in 2013. According to a June 2012 energy and power blog post, this project marks the first time a data center has been designed to rely on fuel cells as its primary energy source with the grid serving as backup (IEEE Spectrum Magazine 2012). Data centers normally rely on electricity from the grid, with a backup system of some kind being available if the grid goes down. Most or all of the fuel for this project will be derived from biogas.

Delmarva Power in Delaware is installing a total of 30 MWs of Bloom Energy's fuel cell technology near two of its substations. When completed, this installation will represent the largest utility-scale deployment of fuel cell technology in the U.S. The Delmarva Power installations of the new technology will use natural gas fuel sources.

Energy Commission staff contacted Bloom Energy for information on the technology and its development status in California. A company representative states that the Bloom Energy power generation systems can be physically located throughout the state and scaled for varying levels of electrical power generation on either side of the meter (Grizard, pers. comm., 2012). The technology is not limited to applications that generate several hundred kWs to serve on-site load. There are grid benefits to locating the systems in areas with transmission and/or distribution line congestion (i.e., developed areas close to load centers), including mitigating voltage variances and increasing grid stability, but this is not a limiting factor, and fuel cell farms are also an option for centralized power production.

A fuel cell facility must use renewable fuel to be eligible for California's RPS program. Development of a Bloom's Energy Server™ system that runs on biogas requires access to the renewable fuel source. Currently there are scarce biogas resources for use under the state's RPS program, and this is proving to be a limiting factor for biogas projects of any type. A few bills in the California Legislature could facilitate delivery of biomethane from intrastate producers and development of future SOFC projects that are eligible for the RPS program. A description of fuel cell facilities and renewable fuels is available in the Energy Commission publication, "Renewables Portfolio Standard Eligibility" (Energy Commission 2012).

Online sources from May 2012 report on a new, small-scale SOFC system developed at the U.S. Department of Energy's (DOE) Pacific Northwest National Laboratory (PNNL) that could be used for household and neighborhood power generation (Gizmag 2012, ScienceDaily 2012). A paper published in the Journal of Power Sources (Powell et al. 2012) describes the work performed by the DOE PNNL team and how SOFCs are being developed for a variety of applications because of their high efficiency over a wide range of power levels. Applications for SOFCs include 1–2-kW residential combined heat and power applications, 100–250-kW systems for distributed generation and grid extension, and megawatt-scale power plants using coal (Powell et al. 2012). The system developed by the DOE PNNL team is a small-scale SOFC power system that operates on methane, which is the primary component of natural gas. The paper describes the team's demonstration of a highly efficient small-scale (approximately 2 kWs) SOFC system that can be readily scaled for a 100–250-kW natural gas-fueled distributed generation application (Powell et al. 2012).

Versa Power Systems is also developing SOFC technology, but it is in the demonstration phase of development and uses hydrogen combined with oxygen to produce electricity (Versa Power Systems 2012).

Decision to Eliminate the Technology from the Alternatives Analysis

Use of this new technology for utility-scale installations in California is not yet a viable alternative. Based on staff's research, SOFCs are primarily being developed and installed for on-site generation of electricity. The work conducted by the DOE PNNL team and described in the Journal of Power Sources indicates that a small-scale SOFC power system can be scaled for distributed generation applications.

Except for the Delmarva Power project, Bloom's Energy Server™ installations described above are primarily serving on-site load. Changes to California state policy is the critical factor needed to drive the utilities to invest in Bloom Energy's SOFC technology and incentivize development of the technology at the utility scale (Grizard, pers. comm., 2012). Because the technology is new, and state policy is not in place to drive the utilities to make the investment, future deployment of large-scale systems in the state cannot be presumed. Also, only development of SOFC technologies using a renewable fuel source would be eligible for the state's RPS program.

Continued development of SOFC technologies and evolving state energy policies may reduce the need for utility-scale projects such as the proposed HHSEGS project. However, the SOFC technology, including Bloom's Energy Server™, is not currently an alternative to a 500-MW utility scale energy generation project.

WIND ENERGY

Overview

Wind turbines, like windmills, are mounted on a tower to capture the most energy from the resource (NREL 2012a). Turbines catch the wind's energy with their propeller-like blades; usually two or three blades are mounted on a shaft to form a rotor. The wind's force against the blade causes the rotor to spin like a propeller, and the turning shaft spins a generator to make electricity. Wind turbines can be used as stand-alone applications (e.g., for water pumping or communications). Wind turbines can be combined with a PV system. For utility-scale applications, large numbers of wind turbines are built in various configurations in the same general area to form a wind power plant. Small wind systems have potential as distributed generation systems. Utility-scale turbines range from 50–750 kWs. Single small turbines generally have a capacity of less than 50 kWs.

The U.S. Bureau of Land Management (BLM) maintains a website with information on wind energy development. Wind energy resources are categorized by wind-power density classes that range from class 1 (the lowest) to class 7 (the highest). Good wind resources are class 3 and above and have average annual wind speeds of at least 13 miles per hour (BLM 2012). Wind speed is a critical feature of wind resources.

In October 2012, BLM issued its Record of Decision approving the Chokecherry and Sierra Madre Wind Energy site in Wyoming (Associated Press 2012). The 2,000–3,000

MW project is planned for construction across an area that includes private and federally-managed land. Roadwork and groundwork for the project could begin in 2013. After that, installation of up to 1,000 wind turbines will be accomplished over approximately 3 years. The project is expected to provide electricity to approximately one million homes.

Wind resources provide 21 percent of California's in-state renewable generation (3 percent of total in-state energy generation) (Energy Commission 2010, 2011b). Although wind is considered a mature technology, it continues to face challenges due to intermittency of the resource, lack of transmission access in remote areas, and environmental issues (Energy Commission 2011b). The majority of onshore wind development is concentrated in four regions of the state: Altamont Pass (east of San Francisco), Tehachapi (southeast of Bakersfield), Solano-Montezuma Hills (Solano County), and San Gorgonio (near Palm Springs, east of Los Angeles). Kern, San Joaquin, and Riverside counties also have large amounts of wind capacity, about 800 MWs, 600 MWs, and 500 MWs, respectively (Energy Commission 2011b).

Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations. Based on staff's research, wind technology is limited to areas with wind resources where the wind-power density is class 3 and above (average annual wind speeds of at least 13 miles per hour). According to the NREL California 50 Meter Wind Resource Map[4], there are a scattering of small areas with superb (class 7) wind resource, mostly in western Inyo County, though most areas have marginal (class 2) to fair (class 3) wind resources. The proposed HHSEGS site is in an extensive area with poor (class 1) wind resources, making it an unsuitable location for a wind energy project.

GEOTHERMAL ENERGY

Overview

Geothermal energy is heat from inside the earth. Geothermal power plants use steam produced from reservoirs of hot water found a few miles or more below the earth's surface to produce electricity (NREL 2012b). The steam rotates a turbine that activates a generator, which produces electricity. There are three types of geothermal power plants: dry steam, flash steam, and binary cycle. Geothermal is a mature industry, and geothermal power plants provide steady and predictable baseload power (National Geothermal Collaborative 2004).

Geothermal energy is limited to areas with reservoirs of steam or hot water, known as hydrothermal resources, which are often associated with volcanic and seismically active regions. California has 25 known geothermal resource areas, including 14 resource areas with temperatures of 300 degrees Fahrenheit or greater. Forty-eight of the fifty-eight California counties have lower temperature resources for direct-use geothermal. The counties with high amounts of geothermal capacity include Sonoma County with

[4] Wind speed estimates at 50 meters (m) above the ground. The map depicts the resource that could be used for community-scale wind development using wind turbines at 50–60-m hub heights.

1,601 MWs of capacity (more than 60 percent of all geothermal capacity installed in California), Imperial County with 650 MWs, and Inyo County with 302 MWs (Energy Commission 2011b). Geothermal plants provide 42 percent of in-state renewable generation (6.2 percent of total in-state energy generation) (Energy Commission 2010, 2011b). The counties with the greatest geothermal resource potential include Sonoma and Imperial.

Because hot water and steam cannot be transported long distances economically, use of geothermal resources is restricted to locations where they are found and initially available (National Geothermal Collaborative 2004). Geothermal steam resources can be depleted over time, leading to a reduction in electricity generation (Energy Commission 2011b). Geothermal exploration is time-consuming because of the difficulty in establishing what, exactly, is in the subsurface.

In Santa Rosa, California, highly treated wastewater from the Laguna Treatment Plant is being pumped to The Geysers steam fields (a large complex of geothermal power plants in Sonoma and Lake counties) to recharge the aquifer. Evidence suggests that the injection of treated wastewater is preserving the geothermal resource and having an added benefit of disposing of treated wastewater.

Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations. Geothermal technology is limited to areas with geothermal resources. There are two known resource areas in Inyo County, the Coso Hot Springs and Saline Valley, both northwest of the project site. Coso Hot Springs is inside the boundary of the China Lake Naval Air Weapons Station, near the Coso Mountains. Saline Valley is northwest of Death Valley and east of the Owens Valley. The proposed HHSEGS site is not a feasible location for a geothermal project.

BIOMASS ENERGY

Overview

Biomass energy or *bioenergy* is the energy from plants and plant-derived materials. Wood is currently the largest biomass energy resource. Other biomass energy resources include food crops, grassy and woody plants, residues from agriculture or forestry, oil-rich algae, and the organic component of municipal and industrial wastes (NREL 2012c). The main biomass feedstocks for power are paper mill residue, lumber mill scrap, and municipal waste. The most common feedstocks used today are corn grain (to make ethanol) and soybeans (to make biodiesel) (NREL 2012c). Biopower is the use of biomass to produce energy and technologies include direct-firing, cofiring, gasification, pyrolysis, and anaerobic digestion.

While biomass facilities can be located throughout California, due to the availability of fuel from forest and agricultural waste, most biomass development occurs in the northern part of the state (Energy Commission 2011b). The counties with the greatest biomass potential from all sources of feedstocks (forestry, agricultural and municipal waste) include Siskiyou, Humboldt, Shasta, Mendocino, Fresno, Tulare, Kern, San Bernardino, Los Angeles, Riverside and San Diego (Energy Commission 2011b). Biomass generation provides nearly 20 percent of in-state renewable generation (2.8

percent of total in-state energy generation) (Energy Commission 2010, 2011b). Additional potential may be limited due to cost, air quality issues, and regulatory barriers.

Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations. Biomass technology is limited to areas with access to biomass feedstock. Inyo County is not a county with large quantities of biomass feedstock. The proposed HHSEGS site is not a feasible location for a biomass project.

SMALL HYDROELECTRIC

Overview

Hydropower is derived from the kinetic energy of flowing water as it moves downstream. Turbines and generators convert the energy into electricity, which is then fed into the electrical grid (U.S. Department of Energy 2011). Small hydroelectric power is defined as systems with a capacity of 30 MWs or less (Energy Commission 2011b). Less than 10 percent of the hydropower units in the state are 30 MW or smaller. Units located in natural waterways may be operated as run-of-the-river where the amount of energy produces at any one time is determined by the current flow in the river. The amount of energy generated from small hydroelectric systems depends largely on the amount of snow and rainfall received, and the amount of hydroelectricity produced varies significantly from year to year (Energy Commission 2011b). Hydropower is considered to be a mature technology, and hydro projects with storage capability have some of the best operating characteristics of any renewable technology.

The three types of hydroelectric facilities are impoundment, diversion, and pumped storage. Some hydropower plants use dams and some do not. Pumped storage systems do not depend solely on runoff and are typically used to provide power during peak demand periods on very short notice. Some power plants are located on rivers, streams, and canals, but for a reliable water supply, dams are needed (U.S. Bureau of Reclamation 2005). Hydropower is available in 52 of the 58 state counties, but the counties with the highest potential energy are in the mountain ranges north and east of the Central Valley. Small hydroelectric power represents 15 percent of in-state renewable generation (2.2 percent of total in-state energy generation) (Energy Commission 2010, 2011b). The counties with the greatest small hydroelectric potential include Siskiyou, Shasta, Plumas, Butte, Sierra, Amador, Calaveras, Stanislaus, Tuolumne, Madera, and Fresno (Energy Commission 2011b).

While there are a variety of equipment options and plant configurations that can accommodate nearly every site condition, the remote location of hydroelectric resources adds challenges to resource development due to the interconnection requirements and suitable market and permitting requirements (Energy Commission 2011b).

Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations. Small hydroelectric technology is limited to areas where water is in motion. A sufficient quantity of falling water is needed for electricity generation, so hilly or mountainous areas are the best sites for hydroelectric

resources. The proposed HHSEGS site is not a feasible location for a small hydroelectric project.

WAVE AND TIDAL ENERGY

Overview

Ocean wave energy technologies rely on the up-and-down motion of ocean waves produced by wind to generate electricity (Ocean Energy Council 2012a). *Wave energy conversion* (WEC) devices can be sorted into several categories based on the type of wave motion from which the devices produce energy. For example, wave motions include the roll or vertical heave of a wave as it passes a device or the horizontal surge in nearer-shore conditions (City and County of San Francisco 2009). Categories of WEC devices include: (1) the attenuator (pitching motion), (2) point absorbers (heave and surge), (3) oscillating surge devices (surge), (4) oscillating water column device (air pressure), (5) overtopping device (breaking wave run-up), and (6) submerged pressure differential (pressure).

Tidal electricity generation has traditionally used a barrage (dam-like structure) across an estuary to block the incoming and outgoing tide (Ocean Energy Council 2012b). When there is adequate difference in the elevation on the different sides of the barrage, the gates are opened, releasing the water through the turbines to generate electricity. Newer technologies use in-stream tidal technology that harnesses offshore tidal streams using underwater devices similar to wind turbines. A tidal range of at least 7 meters (23 feet) is required for economical operation and sufficient head of water for the turbines. The size of the barrage required (length and height) and difference in height between high and low tide are the major factors in determining the cost effectiveness of a tidal power site.

Decision to Eliminate the Technology from the Alternatives Analysis

This technology has technological and practical limitations. Wave and tidal technology is not ready for commercial use (Energy Commission 2011b). Some technologies are closer to commercialization while others are emerging. Wave and tidal technology is limited to areas with water bodies with tidal or wave action. Inyo County does not have areas of wave and tidal resources.

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Alternatives Appendix-3
Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative
(Please see explanatory notes at the bottom of the table)

Environmental Effect	Proposed HHSEGS Project	No-Project Alternative	Sandy Valley Off-site Alternative	Solar Power Tower with Energy Storage Alternative	Solar Photovoltaic Alternative	Parabolic Trough Alternative	Reduced Acreage Alternative
Air Quality							
Construction-related emissions	SM	—	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)
Project operations emissions	SM	—	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Less than HHSEGS (SM)	Similar to HHSEGS (SM)	Somewhat less than HHSEGS (SM)
Biological Resources							
Impacts on special-status plant species	SM	Much less than HHSEGS (LS)	Much less than HHSEGS (SM)	Similar to or somewhat greater than HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Much less than HHSEGS (SM)
Impacts on waters of the U.S. and waters of the state	SM	Much less than HHSEGS (LS)	Much less than HHSEGS (SM)	Similar to or somewhat greater than HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Much less than HHSEGS (SM)
Impacts on desert tortoise	SM	Much less than HHSEGS (LS)	Much less than HHSEGS (SM)	Similar to or somewhat greater than HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Much less than HHSEGS (SM)
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	SM	Much less than HHSEGS (LS)	Much less than HHSEGS (SM)	Similar to or somewhat greater than HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Much less than HHSEGS (SM)
Impacts on avian species from collisions with project features (see biological resources note)	PSU	—	Similar to or somewhat greater than HHSEGS (PSU)	Similar to or somewhat greater than HHSEGS (PSU)	Unknown (PSU)	Unknown (PSU)	Less than HHSEGS (PSU)
Impacts on avian species from exposure to concentrated solar flux	PSU	—	Similar to or somewhat greater than HHSEGS (PSU)	Similar to or somewhat greater than HHSEGS (PSU)	—	—	Less than HHSEGS (PSU)
Potential impacts on groundwater dependent ecosystems	PSM	Somewhat less than HHSEGS (LS)	Somewhat less than HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)	Similar to HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)

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Alternatives Appendix-3
Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative
(Please see explanatory notes at the bottom of the table)

Environmental Effect	Proposed HHSEGS Project	No-Project Alternative	Sandy Valley Off-site Alternative	Solar Power Tower with Energy Storage Alternative	Solar Photovoltaic Alternative	Parabolic Trough Alternative	Reduced Acreage Alternative
Biological resources note: For the Sandy Valley Off-site Alternative and the SPT with Energy Storage Alternative, avian collision impacts could be secondary to exposure to solar flux. For the Parabolic Trough Alternative, collisions could be secondary to retinal damage from glint or glare.							
Cultural Resources							
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see note 1 on cultural resources)	LS	Much less than HHSEGS (LS)	Somewhat greater than HHSEGS (PSM)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Somewhat less than HHSEGS (LS)
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	SU	Much less than HHSEGS (LS)	Similar to HHSEGS (PSU)	Similar to HHSEGS (SU)	Much less than HHSEGS (PSM)	Much less than HHSEGS (PSM)	Somewhat less than HHSEGS (SU)
Potential impacts on significant built-environment cultural resources *on* the site (see note 2 on cultural resources)	SM	Much less than HHSEGS (LS)	Similar to HHSEGS (PSM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Somewhat less than HHSEGS (SM)
Potential impacts on significant built-environment cultural resources *beyond* the site (see note 2 on cultural resources)	SU	Much less than HHSEGS (LS)	Similar to HHSEGS (PSU)	Similar to HHSEGS (SU)	Much less than HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)	Somewhat less than HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	SU	Much less than HHSEGS (LS)	Similar to HHSEGS (SU)	Similar to HHSEGS (SU)	Similar to HHSEGS (PSU)	Similar to HHSEGS (PSU)	Somewhat less than HHSEGS (SU)
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	SU	Much less than HHSEGS (LS)	Similar to HHSEGS (SU)	Similar to HHSEGS (SU)	Somewhat less than HHSEGS (PSU)	Somewhat less than HHSEGS (PSU)	Somewhat less than HHSEGS (SU)
Note 1 on cultural resources: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site. Note 2 on cultural resources: Except for the Sandy Valley Off-site Alternative, the built-environment cultural resource is the Old Spanish Trail – Mormon Road Northern Corridor.							
Fire Protection							
Potential impacts on local fire protection resources	PSM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Less than HHSEGS (PSM)	Much greater than HHSEGS (SM)	Somewhat less than HHSEGS (PSM)
Potential impacts on emergency response services	PSM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Less than HHSEGS (PSM)	Much greater than HHSEGS (SM)	Somewhat less than HHSEGS (PSM)
Geology and Paleontology							
Potential impacts from strong seismic shaking	SM	—	Similar to HHSEGS (PSM)	Same as HHSEGS (SM)	Much less than HHSEGS (PSM)	Much less than HHSEGS (PSM)	Much less than HHSEGS (PSM)

Alternatives Appendix-3
Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative
(Please see explanatory notes at the bottom of the table)

Environmental Effect	Proposed HHSEGS Project	No-Project Alternative	Sandy Valley Off-site Alternative	Solar Power Tower with Energy Storage Alternative	Solar Photovoltaic Alternative	Parabolic Trough Alternative	Reduced Acreage Alternative
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	SM	—	Similar to HHSEGS (PSM)	Same as HHSEGS (SM)	Much less than HHSEGS (PSM)	Much less than HHSEGS (PSM)	Much less than HHSEGS (PSM)
Potential impacts on paleontological resources	SM	—	Similar to HHSEGS (PSM)	Same as HHSEGS (SM)	Less than HHSEGS (PSM)	Less than HHSEGS (PSM)	Much less than HHSEGS (PSM)
Potential impacts on geological or mineralogical resources	LS	—	Similar to HHSEGS (LS)	Same as HHSEGS (LS)	Same as HHSEGS (LS)	Same as HHSEGS (LS)	Same as HHSEGS (LS)
Hazardous Materials							
Potential for release of hazardous materials to occur on-site	SM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Somewhat greater than HHSEGS (SM)	Similar to HHSEGS (PSM)
Potential for release of hazardous materials to occur off-site	SM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Somewhat greater than HHSEGS (SM)	Similar to HHSEGS (PSM)
Land Use							
Conflicts or inconsistencies with general plan land use designations and zoning	SU	—	Similar to HHSEGS (SU)	Same as HHSEGS (SU)	Same as HHSEGS (SU)	Same as HHSEGS (SU)	Same as HHSEGS (SU)
Conversion of agricultural land	—	—	Much greater than HHSEGS (SM)	—	—	—	—
Noise and Vibration							
Potential for noise to impact noise-sensitive receptors	PSM	—	Somewhat greater than HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Much less than HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)
Public Health							
Potential for project construction to cause air toxics-related impacts that could affect public health	LS	—	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)
Potential for project operations to cause air toxics-related impacts that could affect public health	LS	—	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Less than HHSEGS (LS)	Similar to HHSEGS (LS)	Less than HHSEGS (LS)
Socioeconomic Resources							

Alternatives Appendix-3
Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative
(Please see explanatory notes at the bottom of the table)

Environmental Effect	Proposed HHSEGS Project	No-Project Alternative	Sandy Valley Off-site Alternative	Solar Power Tower with Energy Storage Alternative	Solar Photovoltaic Alternative	Parabolic Trough Alternative	Reduced Acreage Alternative
Construction employment and increased taxes and fees	B	—	Similar to HHSEGS (B)	Similar to HHSEGS (B)	Similar to HHSEGS (B)	Similar to HHSEGS (B)	Similar to HHSEGS (B)
Displacement of existing rural residences	—	—	Greater than HHSEGS (LS)	—	—	—	—
Potential impacts on emergency medical and law enforcement services	PSM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)
Traffic and Transportation							
Potential impacts on roadway infrastructure	SM	—	Similar to HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Same as HHSEGS (SM)
Potential for glint and glare to cause safety hazards or a distinct visual distraction effect from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	PSM	—	Similar to HHSEGS (PSM)	Same as HHSEGS (PSM)	Much less than HHSEGS (LS)	Less than HHSEGS (PSM)	Similar to HHSEGS (PSM)
Potential for construction equipment and/or permanent structures to exceed 200 feet in height above ground level	SM	—	Similar to HHSEGS (SM)	Same as HHSEGS (SM)	—	—	Same as HHSEGS (SM)
Transmission Line Safety and Nuisance							
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	SM	—	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)
Visual Resources							
Construction-Related Impacts							
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	—	Similar to HHSEGS (SU)	Similar to HHSEGS (SU)	Less than HHSEGS (SM)	Similar to HHSEGS (SU)	Similar to HHSEGS (SU)
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	—	Similar to HHSEGS (SU)	Similar to HHSEGS (SU)	Less than HHSEGS (SM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (SU)
Project Operations Impacts							
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	SU	—	Similar to HHSEGS (SU)	Same as HHSEGS (SU)	Much less than HHSEGS (PSM)	Somewhat less than HHSEGS (SU)	Similar to HHSEGS (SU)

Alternatives Appendix-3 Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative (Please see explanatory notes at the bottom of the table)							
Environmental Effect	Proposed HHSEGS Project	No-Project Alternative	Sandy Valley Off-site Alternative	Solar Power Tower with Energy Storage Alternative	Solar Photovoltaic Alternative	Parabolic Trough Alternative	Reduced Acreage Alternative
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	SU	—	Similar to HHSEGS (SU)	Same as HHSEGS (SU)	Much less than HHSEGS (PSM)	Somewhat less than HHSEGS (SU)	Similar to HHSEGS (SU)
Waste Management							
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	SM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)
Potential for impacts on human health and the environment related to past or present soil or water contamination	PSM	—	Somewhat greater than HHSEGS (PSM)	Similar to HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)
Soil and Surface Water							
Soil erosion by wind and water during project construction	SM	—	Similar to HHSEGS (SM)	Greater than HHSEGS (SM)	Somewhat less than HHSEGS (SM)	Much greater than HHSEGS (SM)	Less than HHSEGS (SM)
Soil erosion by wind and water during project operations	PSM	Much less than HHSEGS (LS)	Similar to HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Less than HHSEGS (PSM)	Less than HHSEGS (PSM)	Less than HHSEGS (PSM)
Water quality impacts from contaminated storm water runoff	SM	Much less than HHSEGS (LS)	Same as HHSEGS (SM)	Somewhat greater than HHSEGS (SM)	Much less than HHSEGS (LS)	Somewhat greater than HHSEGS (SM)	Less than HHSEGS (SM)
Water quality impacts from storm damage	PSM	—	Similar to HHSEGS (PSM)	Similar to HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Greater than HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)
Water quality impacts from power plant operations	SM	—	Same as HHSEGS (SM)	Somewhat greater than HHSEGS (SM)	Much less than HHSEGS (LS)	Similar to HHSEGS (SM)	Less than HHSEGS (SM)
Water quality impacts from sanitary waste	SM	—	Same as HHSEGS (SM)	Same as HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Somewhat less than HHSEGS (SM)
Potential impacts from on-site and off-site flooding	SM	—	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Similar to HHSEGS (SM)	Much less than HHSEGS (SM)	Similar to HHSEGS (SM)
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency	LS	—	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)	Similar to HHSEGS (LS)

Alternatives Appendix-3
Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative
(Please see explanatory notes at the bottom of the table)

Environmental Effect	Proposed HHSEGS Project	No-Project Alternative	Sandy Valley Off-site Alternative	Solar Power Tower with Energy Storage Alternative	Solar Photovoltaic Alternative	Parabolic Trough Alternative	Reduced Acreage Alternative
Management Agency maps							
Water Supply							
Potential impacts on local wells	PSM	Somewhat less than HHSEGS (LS)	Similar to HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)	Similar to HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)
Potential impacts on groundwater basin balance	PSM	Somewhat less than HHSEGS (LS)	Similar to HHSEGS (PSM)	Somewhat greater than HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)	Similar to HHSEGS (PSM)	Somewhat less than HHSEGS (PSM)

Notes: The comparison of impacts to the proposed project is conveyed, for most impacts, using these terms in a graded scale:

- Much less than HHSEGS
- Less than HHSEGS
- Somewhat less than HHSEGS
- Similar to HHSEGS
- Same as HHSEGS
- Somewhat greater than HHSEGS
- Greater than HHSEGS
- Much greater than HHSEGS

Notes: Impact conclusions for the proposed project and the comparative impacts for the alternatives are shown using these abbreviations:

— = no impact
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

ALTERNATIVES

List of Comment Letters

		Alternatives Comments?
1	Inyo County	
2	Bureau of Land Management	
3	National Park Service	
4	The Nature Conservancy	
5	Amargosa Conservancy	**X**
6	Basin & Range Watch	**X**
7	Pahrump Paiute Tribe	
8	Richard Arnold, Pahrump Piahute Tribe	
9	Big Pine Tribe of Owens Valley	**X**
10	Intervenor Cindy MacDonald	**X**
11	Intervenor Center for Biological Diversity	**X**
12	Intervenor, Old Spanish Trail Association	
13	Applicant, BrightSource Energy, Inc.	**X**

Comment #	DATE	COMMENT TOPIC	RESPONSE
5	**July 21, 2012**	**The Amargosa Conservancy**	
5.5		Request to analyze alternative sources of water for the project. Request to examine alternative locations such as Sandy Valley and alternative technologies such as solar PV and distributed generation.	Staff has not identified any viable alternative sources of water for the project. See the full analyses of the Sandy Valley Off-site Alternative and the Solar PV Alternative in the final staff assessment under the subsection, "Alternatives Evaluated in Detail." See also the discussion and analysis under the subsection, "Distributed Generation," of staff's alternatives analysis.
5.10		Same comment as 5.5.	See response to comment 5.5.

Comment #	DATE	COMMENT TOPIC	RESPONSE
6	**July 23, 2012**	**Basin and Range Watch**	
6.1		Staff assessment does not consider private lands outside of the area.	See the full analysis under the subsection of staff's alternatives analysis, "Sandy Valley Off-site Alternative," which is mostly on private lands. See also the analysis of the potential feasibility of an alternative site on private land in the West Mojave under the subsection, "Barstow Preliminary Renewable Energy Study Area."
6.2		Staff assessment does not consider an off-site alternative on disturbed or degraded lands.	See response to comment 6.1.
6.3		Staff assessment does not evaluate a distributed generation (DG) alternative. States that the Energy Commission reviewed the DG alternative for other projects, including Ivanpah and Genesis.	See a full discussion of the DG category of renewable energy under the subsection of staff's alternatives analysis, “Distributed Generation." The alternatives analyses for the Palen Solar Power Project (PSPP), Ivanpah Solar Electric Generating System (ISEGS), and Genesis Solar Energy Project (GSEP) evaluated DG. For PSPP, staff eliminated DG from consideration and concluded that it was unknown whether the 500 MW of power generation could be achieved to replace the generating capacity of PSPP. For ISEGS, staff eliminated DG from the analysis and concluded that concentrating solar power (CSP) projects cannot be replaced by DG installations and that CSP projects are also needed to achieve the state’s renewables portfolio standard goals. For GSEP, staff eliminated the technology from detailed consideration and concluded that installlation of 250 MW of DG capacity could not be guaranteed to be accomplished in the timeframe for the project.

6.4		Distributed generation should be given a much more full analysis, as it is a completely viable alternative.	See the discussion and analysis of the DG category of renewable energy under the subsection of staff's alternatives analysis, "Distributed Generation." See also the discussion under the subsection, "Decision to Eliminate this Category of Renewable Energy Generation from Detailed Consideration."
6.5		Alternatives should be evaluated that are in load centers. The entire state should be considered.	See staff's analysis of the potential feasibility of an alternative site in the West Mojave, which is closer to a load center than the proposed project; see the subsection in staff's alternatives analysis, "Barstow Preliminary Renewable Energy Study Area." Staff's alternatives analysis was prepared in accordance with the California Environmental Quality Act (CEQA) regulations and guidelines. See the full discussion of those requirements under the subsections of staff's alternatives analysis, "CEQA Requirements," and, "Alternatives Screening." CEQA does not require an alternatives analysis to evaluate vast regional areas across the state to identify a different site for the proposed project.
6.6		A master comprehensive plan should exist to determine recreational and biodiversity resources on public lands, assumptions for integrating various fuels mixes and technologies into the utilities' plans, a state plan, and a national plan. Loads should be carefully analyzed to determine whether additional capacity is needed. The plan might recommend building smaller units in cities.	See response to comment 6.5. Staff observes that planning efforts at the state and federal level are occurring to analyze and identify areas for development of renewable energy projects. See a brief description of the Desert Renewable Energy Conservation Plan (DRECP) under the subsection of staff's alternatives analysis, "Barstow Preliminary Renewable Energy Study Area." More information on the DRECP is at: <http://www.drecp.org>. See also the extensive resources on renewable energy planning and development on the California Energy Commission and California Public Utilities Commission (CPUC) websites. See also the online information center for the Solar Energy Development Programmatic EIS at: <http://solareis.anl.gov/>.

6.7		Renewables should be distributed generation in load centers. DG is a known technology that is proven in Germany. Environmental impacts of the proposed project could be avoided with a DG alternative.	See responses to comments 6.3 and 6.4. The subsection of staff's alternatives analysis, "Distributed Generation," describes incentive programs for customer-side of the meter and utility-side of the meter DG. CPUC regulates DG policies and programs in California. See the CPUC website for more information: <http://www.cpuc.ca.gov/PUC/energy/DistGen/>. See also information on the California Solar Initiative, the solar rebate program for the state's customers of Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric: <http://www.gosolarcalifornia.org/about/csi.php>. The Energy Commission, along with other state agencies, work to support the state's renewables portfolio standard program goals, including goals for implementing DG. The Energy Commission publishes the Integrated Energy Policy Report (IEPR); the IEPR process features workshops and proceedings for public participation. The February 2012 IEPR addresses strategies to encourage demand for self-generation technologies, including PV systems. See the citation and reference in staff's alternatives analysis for the IEPR: Energy Commission 2012b. See also the Energy Commission's website for details on research and development, programs, incentives, permitting, etc., on the state's distributed energy resources: <http://www.energy.ca.gov/distgen/>.
6.8		Energy Commission staff rejected an alternative with a smaller footprint.	This comment refers to the discussion under the subsection of staff's alternatives analysis, "Alternatives Considered in the Application for Certification." This subsection of staff's analysis explains why the Applicant (not Energy Commission staff) rejected a smaller project alternative. The final staff assessment includes a full analysis of an alternative with a smaller site footprint. See the subsection in staff's alternatives analysis, "Reduced Acreage Alternative."

6.9		Energy Commission staff rejected an alternative with a smaller footprint for the benefit of BrightSource Energy.	See response to comment 6.8.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
9	**July 21, 2012**	**Big Pine Tribe of Owens Valley**	
9.4		Recommends inclusion of a DG alternative in staff's alternatives analysis	See the discussion and analysis of the DG category of renewable energy under the subsection of staff's alternatives analysis, "Distributed Generation." See also responses to comments 6.3, 6.4, and 6.7 in the comment letter from Basin and Range Watch.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
10	**July 21, 2012**	**Intervenor Cindy MacDonald -- Alternatives, p. 4-1**	
10.1	**p. 4-2, #1**	Requests details on information provided by the Applicant to Energy Commission staff on the Bloom's Energy Server™ distributed power generator.	Susan Strachan provided information on Bloom's Energy Server™ in an e-mail to staff on March 14, 2012. The information was provided on behalf of the Applicant and included: the Bloom Energy Corporation product data sheet on the ES-5700 energy server; and the company brochure, company overview, and Bloom Electrons℠ overview.
10.2	**p. 4-2, #2**	Requests evidence that the Applicant contacted Bloom Energy Corporation regarding the site-specific feasiblity and viability of using the technology at the proposed project site.	Energy Commission staff contacted Bloom Energy in August 2012 and received detailed information on the company's technology and its development status in California. Please see the revised and expanded discussion in the appendix to staff's alternatives analysis, "Appendix Alternatives-1: Other Renewable Energy Technologies," under the subsection, "Solid Oxide Fuel Cells."

10.3	**p. 4-3, #1**	Requests information on the Applicant's statement that Bloom's Energy Server™ performs poorly in the heat, and inquires whether a climate-controlled building could resolve that issue.	See response to comment 10.2.
10.4	**p. 4-3, #2**	Requests information on the Applicant's statement that an alternative using Bloom's Energy Server™ would not qualify for the state's renewables portfolio standard (RPS) program requirements, and asks why this is important.	See the subsection in staff's alternatives analysis, "Alternatives Screening," which includes a brief discussion of the state's RPS program; this subsection of the analysis also describes the importance of achieving the state's RPS program goals and identifies a project objective to develop a renewable energy facility that will help publicly owned electric utilities satisfy those goals. Details on the state's RPS program is on the Energy Commission and CPUC websites. See the revised discussion of solid oxide fuel cells (SOFCs) in Alternatives Appendix-1, "Other Renewable Energy Technologies." As described in Alternatives Appendix-1, SOFCs (e.g., Bloom's Energy Server™) are being installed primarily to serve on-site load. See also the Energy Commission's, "Renewables Portfolio Standard Eligibility," Fifth Edition, May 2012 (publication number CEC-300-2012-002-CMF), which discusses fuel cell facilities using renewable fuel and their eligibility for the state's RPS program. Fuel cell facilities using natural gas are not eligible.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
11	**July 23, 2012**	**Intervenor Center for Biological Diversity (CBD)**	

11.1		Refers to the California Environmental Quality Act (CEQA) Statute and Guidelines, describing sections that address feasible alternatives and conditions under which an alternative may not be approved.	Staff observes that the comment misinterprets the State CEQA Statute and Guidelines. Section 15021 of the State CEQA Guidelines describes the duty of public agencies to avoid or minimize environmental damage and balance competing public objectives. The comment from CBD does not acknowledge Section 15021(b), which allows a public agency to consider specific economic, environmental, legal, social, and technological factors in deciding whether changes in a project are feasible. Section 15126.6(c) of the Guidelines addresses selection of a range of potential alternatives, which "shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects." No statement is made in Section 15126.6 addressing a requirement to reject the project.
11.2		States that environmental review documents must consider a range of alternatives, including alternative sites. States that the alternatives analysis for the proposed project is too limited and should explore other alternatives.	The Sandy Valley Off-site Alternative site was fully analyzed and compared to the proposed project in staff's alternatives analysis. The alternative site is in an area with relatively disturbed habitat. Several hundred acres are in agricultural use, and on-site habitat values have been compromised as a result. See the subsection in the alternatives analysis, "Sandy Valley Off-site Alternative." Staff also evaluated the potential feasibility of an alternative site on private land in the West Mojave; see the subsection in staff's alternatives analysis, "Barstow Preliminary Renewable Energy Study Area". Please also see the discussion and analysis of the "No-Project Alternative," which allows decision makers to compare the impacts of approving the proposed HHSEGS project with the impacts of not approving the proposed project, in accordance with the State CEQA Guidelines (Cal. Code Regs., tit. 14, § 15126.6[e]).

11.3		States that staff's alternatives analysis has not adequately explored alternative sites, and that only one off-site alternative was evaluated in any detail. States that looking at one alternative site does not fulfill the Energy Commission's duty under CEQA.	In describing the purpose of an alternatives analysis, the State CEQA Guidelines state that "the discussion of alternatives shall focus on alternatives to the project *or* its location which are capable of avoiding or substantially lessening any siginificant effects of the project...(Cal. Code Regs., tit. 14, § 15126.6[b]). CEQA requires consideration of a "reasonable range of potentially feasible alternatives that will foster informed decision making and public participation" (Cal Code Regs., tit. 14, § 15126.6[a]). See also response to comment 11.2. Nowhere is it stated in the alternatives analysis that there are no other sites in California where the project objectives could be accomplished. As stated in response to comment 6.5 in the comment letter from Basin and Range Watch, CEQA does not require an alternatives analysis to evaluate vast regions to identify a different site for the proposed project. Staff's alternatives analysis complies with the requirements of CEQA.
11.4		States that it is unclear if Sandy Valley refers to a currently proposed project called Sandy Valley SEGS.	BrightSource Energy has submitted a Plan of Development to the U.S. Bureau of Land Management (BLM) for its "Sandy Valley" project, a 750-MW solar power tower (SPT) project in Nevada a few miles southeast of the proposed HHSEGS site. BrightSource Energy's Sandy Valley project in Nevada is in the list of cumulative projects in the **EXECUTIVE SUMMARY** of the staff assessment. The Sandy Valley Off-site Alternative site that is evaluated in staff's alternatives analysis is in the Mesquite Valley in California in Inyo and San Bernardino counties. The alternative site is adjacent to the community of Sandy Valley, Nevada, and it is unrelated to BrightSource Energy's 750-MW SPT project named Sandy Valley.

11.5		The comment summarizes the potential environmental impacts of the Solar Photovoltaic Alternative compared to the proposed HHSEGS project.	Staff acknowledges the comments on the Solar PV Alternative.
11.6		States that the alternative technology alternatives in staff's analysis appear to have been eliminated because of their "effectiveness." The comment references a page in the subsection of the alternatives analysis, "Power Plant Efficiency and Reliability."	Staff's alternatives analysis fully evaluates three alternative technologies, including the Solar Power Tower with Energy Storage Alternative, Solar Photovoltaic Alternative, and Parabolic Trough Alternative. None of these alternatives were eliminated from staff's analysis. The subsection in staff's alternatives analysis, "Engineering Assessment of the Alternatives," compares the effectiveness of the different solar collectors for each alternative. The engineering assessment of the solar collectors provides information that is applicable to a comparative analysis of alternatives. Staff's alternatives analysis also evaluates and compares environmental impacts of the proposed project to the same or similar impacts of the project alternatives.
11.7		States that staff's alternatives analysis is deficient and refers to a CEQA court case in which the environmental impact report was rejected for not meeting the information requirements of CEQA. The comment suggests that the alternatives analysis for the proposed project relies too heavily on the Applicant's objectives and did not consider a smaller alternative that would have been environmentally superior.	See response to comment 6.8 in the comment letter from Basin and Range Watch.

11.8 Prt 1		States that staff's alternatives analysis unreasonably narrows the project objectives and includes timing of the environmental reivew as a basic objective of the project.	Staff did not indicate that timing of the environmental review is a basic objective of the project. The objective states: "Obtain site control and use within a reasonable time frame." The project objective addressed in this comment actually broadens the original project objective provided by the Applicant, which addresses "the potential of achieving a commercial on-line date as soon as possible, targeted for the first/second quarter of 2015."
11.8 Prt 2		States that staff's analysis fails to address whether the proposed project will result in sales of competitively priced renewable energy.	Pricing of renewable energy is not addressed in staff's alternatives analysis. As stated in staff's alternatives analysis (see the discussion of feasibility issues for the SPT with Energy Storage Alternative), the power generated by the proposed HHSEGS project would be sold to PG&E under two power purchase agreements (PPAs) approved by CPUC in 2010. The PPAs are approved, signifying that CPUC considers the energy to be reasonably priced (i.e., to reflect a competitive price).
11.8a		States that the timing of the environmental review cannot be used as a basic objective of the project to limit the analysis of alternatives that would avoid significant impacts to the environment, and biological resources in particular. A comprehensive exploration of a range of alternative sites will avoid significant impacts of the proposed project.	See response to comment 11.8. Staff evaluated the potential feasibility of eight off-site alternatives to the proposed project. See the subsection in staff's alternatives analysis, "Review of Off-site Alternatives." Of those eight sites, the Sandy Valley alternative site was fully analyzed and compared to the proposed project in staff's analysis. See the subsection, "Sandy Valley Off-site Alternative." As stated above, staff also evaluated the potential feasibility of an alternative site on private land in the West Mojave.
11.9		States that staff's alternatives analysis should evaluate re-use of disturbed sites as an alternative to the proposed project.	See response to comment 6.5 in the comment letter from Basin and Range Watch. See also response to comment 11.2.

11.10		States that staff's alternatives analysis should explore the use of a distributed generation alternative.	See responses to comments 6.3, 6.4, and 6.7 in the comment letter from Basin and Range Watch. See also response to comment 9.4 in the comment letter from Big Pine Tribe of Owens Valley.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
13	**July 23, 2012**	**Applicant, BrightSource Energy, Inc. -- Alternatives p. 18**	
13.14	**p. 18, #1**	Replace references to "BrightSource" with HHSEGS or the Applicant.	Staff changed all citations and references pertaining to the proposed project to Hidden Hills Solar I, LLC; Hidden Hills Solar II, LLC.
13.15	**p. 18, #2**	The alternatives analysis in the staff assessment should be based on the Applicant's project objectives.	Staff's alternatives analysis is substantially based on the Applicant's original project objectives. The issue was addressed by the Hidden Hills Committee in the "ORDER RE: APPLICANT'S MOTION IN LIMINE" dated and posted October 2, 2012 (Docket tn: 67435 CEC 2012ff).
13.16	**p. 20, #3**	States that the underlying purpose of the project is to construct the Applicant's proposed project by a specific date.	The subsection in staff's alternatives analysis, "Alternatives Screening," clearly describes CEQA requirements for a statement of objectives and the underlying purpose of the project. Staff's alternatives analysis complies with the requirements of CEQA.

13.17	**p. 21, #4**	The project objecives in the staff assessment are not the objectives of the Applicant. States that the Commission has no authority to transform the project objectives into generic policy objectives.	Staff's alternatives analysis did not consider the project objectives from the application for certification (AFC) that specifically address using BrightSource's proprietary technology and complying with provisions of the power sales agreements with a commercial on-line date targeted for the first/second quarter of 2015. These two project objectives specifically address implementation of the Applicant's proposed project. Nothing in CEQA supports such a narrowing of an alternatives analysis that would result from including such objectives. Using the Applicant's two referenced project objectives in a comparison of project alternatives would overly influence the alternatives analysis. Relying on project objectives that directly target approval and construction of the proposed project is inconsistent with the purpose of CEQA for an alternatives analysis.
13.18	**p. 21, #5**	Staff's alternatives analysis arbitrarily eliminates the Applicant's project objectives. A table should be included comparing the project objectives from the AFC to those in the alternatives analysis of the staff assessment.	The subsection of staff's alternatives analysis, "Alternatives Screening," references the Applicant's original project objectives in the "Executive Summary" of the AFC for the project. The AFC is available to all interested parties in the Applicant's documents for the project proceeding on the Energy Commission's website. It is not necessary to list them in staff's alternatives analysis.
13.19	**p. 21, #6**	States that two off-site alternatives, Calvada South and Trona, were presented in the AFC but eliminated from the staff assessment. Also states that these alternatives are within the reasonable range of alternatives to the project because they satisfy most of the project objectives.	The subsection in staff's alternatives analysis, "Review of Off-site Alternatives," evaluates in detail the potential feasibility of the Calvada South and Trona off-site alternatives. Based on staff's analysis, neither of these alternative sites could avoid or lessen any significant effects of the project. Staff concluded, based on a careful screening analysis, that the significant effects of either off-site alternative would be greater than those identified for the proposed project. Staff's analysis complies with the requirements of CEQA.

13.20	**p. 21, #7**	Suggests that staff's alternatives analysis includes alternative locations that would not avoid or substantially lessen a significant effect of the project. Suggests that the project objectives in the alternatives analysis fit staff's preferred outcome. States that the staff assessment should describe how the alternative locations avoid or substantally lessen a significant effect of the project.	Staff evaluated the potential feasibility of the same eight off-site alternatives to the proposed project that are discussed in the AFC. Staff determined that the AFC presented insufficient information to eliminate the Sandy Valley Off-site Alternative from detailed consideration in the alternatives analysis; therefore, staff's analysis evaluates and compares the off-site alternative to the proposed project. The complete analysis is in the subsection of staff's alternatives analysis, "Sandy Valley Off-site Alternative." Staff's analysis objectively compares the potential environmental effects of the project alternatives to the proposed project. Staff's analysis complies with the requirements of CEQA.
13.21	**p. 22, #8**	The staff assessment must address whether the alternatives examined themselves cause one or more significant effects.	Staff's alternatives analysis evaluates and compares the environmental impacts of the proposed project to the same or similar impacts that would occur under each of the project alternatives. See the subsection in staff's alternatives analysis, "Alternatives Evaluated in Detail."
13.22	**p. 22, #9**	States that development of 170 parcels with single-family residences at the HHSEGS site is reasonably foreseeable under the No-Project Alternative. States that the No-Project Alternative should be revised to evaluate the potential environmental impacts from development of 170 homes sites, wells, and related infrastructure.	An EIR was prepared in 1974 by the Inyo County Planning Department for a project to subdivide and develop several thousand acres in Pahrump Valley, an area that includes the present site for the proposed project. It has been close to 40 years since the area was approved for development, and no residences or other occupied structures were ever constructed at the proposed HHSEGS site. See the complete discussion and analysis under the subsection in staff's alternatives analysis, "No-Project Alternative."
13.23	**p. 23, #10**	States that Alternatives Appendix-2 should be revised to reflect development under the No-Project Alternative of 170 single-family residences and related infrastructure.	See response to comment 13.22, above.

13.24	**p. 23, #11**	Replace references to "BrightSource Energy" with HHSEGS or the project companies' names.	See response to comment 13.14, above.
13.25	**p. 23, #12**	Requests citations and quotations in the staff assessment for sections of the State CEQA Guidelines that address feasibility.	The definition of feasibility in Section 15364 of the State CEQA Guidelines is in the subsection of staff's alternatives analysis, "Alternatives Evaluated in Detail." A description of what is meant by a range of reasonable alternatives is near the beginning of staff's alternatives analysis, under the subsection, "CEQA Requirements," and the citation is included.
13.26	**p. 24, #13**	Quotes Section 15126.6(e)(3)(B) of the State CEQA Guidelines and suggests that the No-Project Alternative would result in "predictable actions by others" (i.e., development of single-family residences on 170 parcels at the site).	See response to comment 13.22, above.
13.27	**p. 24, #14**	States that the site is partially developed by graded roads, distribution lines, and existing wells.	Staff responded to this comment in the alternatives analysis under the subsection, "No-Project Alternative." Staff confirms that the proposed project site is undeveloped and vacant.
13.28	**p. 24, #15**	States that the proposed project site is not Inyo County's land. States that no development plan is needed for future use of the site. States that development of up to 170 parcels for agricultural or residential use can occur without further discretionary approvals or environmental review. States that sale and development of up to 170 lots would occur if the proposed project was not approved.	Inyo County is the local agency with jurisdiction over the unincorporated area of the county. See response to comment 13.22, above.
13.29	**p. 25, #16**	Requests removal of the sentence from the alternatives analysis, "[t]he lack of a water source will continue to restrain development in the Charleston View area."	As requested, staff removed the sentence from the analysis. See the revised discussion and analysis under the subsection of staff's alternatives analysis, "No-Project Alternative."

13.30	**p. 25, #17**	Describes issuance of well permits by Inyo County and describes how the County has a legal duty to issue a permit that meets the ministerial criteria of the permit. The Applicant states that "[t]he No Project Alternative is characterized by the existing land use entitlement to develop 170 parcels and to assume the entitlement does not exist or would not be exercised is speculative and not supported by substantial evidence." States that the landowners and Inyo County want to see this land developed, even if the proposed project is not approved.	Staff has revised the alternatives analysis under the subsection, "No-Project Alternative," including removing the statement that it is "unknown whether the County would issue a well permit for a new residence." The "no project" analysis is required to discuss, "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services" (Cal Code Regs., tit. 14, § 15126.6[e][2]). The Applicant's opinion on the probability of a significant level of development occurring at the project site under the No-Project Alternative is extremely speculative. See also response to comment 13.22. The mere existence of subdivided property does not make development of the area reasonably foreseeable. It is the Applicant's opinion that the landowners and Inyo County "want to see this land developed." Staff confirms that the No-Project Alternative is characterized by the continuation of existing conditions at the HHSEGS site.
13.31	**p. 26, #18**	States that the proposed project would not have a cone of depression impact beyond the project site boundary. States that the conclusion in the alternatives analysis for impacts on groundwater dependent plants and wildlife under the No-Project Alternative is incorrect; refers to the "Biological Resources" section and discussions of the current signs of stress on existing groundwater-dependent vegetation.	See the **WATER SUPPLY** section in the final staff assessment for a full analysis of potential impacts of the proposed project on groundwater resources. It is unsubstantiated opinion that the No-Project Alternative would result in development of 170 parcels. See response to comment 13.22.
13.32	**p. 26, #19**	States that the discussion of impacts on cultural resources must be revised to consider residential or agricultural development on 170 parcels.	It is unsubstantiated opinion that the No-Project Alternative would result in development of 170 parcels. See response to comment 13.22.

13.33	**p. 26, #20**	States that the discussion of impacts on soil and surface water resources must be revised to consider residential or agricultural development on 170 parcels. States that because of the low-impact design and sheet flow drainage that would minimize impact on soil and surface water resources, staff's conclusion that impacts under the No-Project Alternative would be "much less than HHSEGS" is an exaggeration.	It is unsubstantiated opinion that the No-Project Alternative would result in development of 170 parcels. Although the proposed project's low-impact design and sheet flow would lessen impacts to soil and surface water, those impacts are not reduced to the level that is "similar to" or "somewhat less" than a site that is not developed. The proposed project includes the grading of roughly 440 acres during construction and about 850 acres of impervious area during operations. A portion of the west perimeter road would be elevated for the purpose of flooding about 125 acres and water would overtop this road after 20 percent of the storm events. Best Management Practices and conditions of certification would be implemented to protect soil and water resources, but the No-Project Alternative comparison is with continuation of existing conditions, which also accounts for the possibility of minor land use changes occurring at the site. Staff's determination that impacts would be much less than HHSEGS is not an exaggeration. See also response to comment 13.22.
13.34	**p. 26, #21**	States that the discussion of impacts on water supply must be revised to consider residential or agricultural development on 170 parcels.	It is unsubstantiated opinion that the No-Project Alternative would result in development of 170 parcels. See response to comment 13.22.
13.35	**p. 26, #22**	Refers to the conclusion for water supply under the No-Project Alternative, which states that "impacts from potential drawdown of local wells and impacts on groundwater basin balance would be much less than HHSEGS." The Applicant states that there are no facts or analysis to support the conclusion.	See the **WATER SUPPLY** section of the final staff assessment for a full analysis of potential impacts of the proposed project on groundwater resources. Under the No-Project Alternative, no uses are proposed at the site that would require groundwater pumping.

13.36	**p. 27, #23**	The applicant states that, "the law is very clear that an alternatives analysis should consider [of] a reasonable range of alternatives that will meet the Applicant's project objectives and it is inappropriate to substitute the Lead Agency's policy objectives for the Applicant's project objectives, merely to facilitate consideration of an alternative that may be favored by the agency." Provided edited text for a sentence in staff's analysis about the applicant's project objectives.	The Applicant's statements are false. Staff's alternatives analysis is substantially based on the Applicant's project objectives; staff eliminated the project objectives that specifically address implementing the Applicant's proposed project. It is not correct that staff's alternatives analysis must only use the project objectives provided by the Applicant in the AFC. There is no such requirement. See also responses to comments 13.15, 13.16, 13.17, and 13.18, above. Staff edited this sentence in the alternatives analysis, which now reads: "The alternatives analysis cannot be guided by project objectives that specifically target implementation of the project as proposed; this approach would lead the analysis toward a conclusion that no alternative is as valid as the applicant's proposal, which would be inconsistent with CEQA's purpose for an alternatives analysis."
13.37	**p. 27, #24**	States that the Applicant's project objectives permit consideration of a reasonable range of alternatives.	See responses to comments 13.15, 13.16, 13.17, 13.18, and 13.36, above.
13.38	**p. 27, #25**	Refers to impacts on groundwater dependent species for the Sandy Valley Off-site Alternative and questions the conclusion that impacts under this alternative would be "somewhat less than HHSEGS."	Because the Sandy Valley Off-site Alternative is located in an area with greater overall ground disturbance compared to the proposed project, the effect of declining groundwater levels on groundwater dependent species is somewhat less than HHSEGS under this alternative.

13.39	**p. 27, #26**	Refers to impacts on groundwater dependent species (e.g., mesquite bosques) for the Sandy Valley Off-site Alternative. States that there are no mesquite bosques near the HHSEGS site.	The importance of mesquite habitats—in all forms—is a matter of empirical fact, supported by the literature, and by resource agency policy and practice. All mesquite in southern Nevada, and particularly the mesquite in Pahrump Valley and Stump Springs, are recognized conservation priorities in the BLM-sponsored "Mesquite-Acacia Conservation Management Strategy" (Crampton et al. 2006), adopted for the Clark County Multiple Species Habitat Conservation Plan. Staff notes that the California Natural Diversity Database (data date January 3, 2012) nomenclature of “mesquite bosque” is reflected in the FSA alternatives analysis, and shows mesquite bosques at less than 3.0 miles from the Sandy Valley alternative site. Mesquite-dominated habitat at Stump Springs is approximately 5.0 miles from the proposed project site.
13.40	**p. 27, #27**	Refers to the introductory statement of impacts on cultural resources for the Sandy Valley Off-site Alternative. Questions the conclusion that impacts on cultural resources for the alternative site would be "somewhat greater than those of the proposed HHSEGS project." Questions what the conclusion means.	The cited statement introduces the analysis of impacts on cultural resources. See staff's full analysis pertaining to this alternative on the several pages that follow the introductory statement.
13.41	**p. 28, #28**	Refers to the potential land use impact for the Sandy Valley Off-site Alternative related to potential conflicts with applicable plans. Questions the conclusion that the impact would be "similar to HHSEGS." States that "HHSEGS has applied for a general plan amendment overlay and zoning overlay."	Although the Applicant has applied for a general plan amendment and zoning overlay, Inyo County has deemed the application incomplete due to the lack of the appropriate land owner signatures on the proposed HHSEGS project site. As of the date of the final staff assessment, the project is inconsistent with the general plan and zoning code.

13.42	**p. 28, #29**	Questions whether the Sandy Valley Off-site Alternative would comply with the Northern and Eastern Mojave Desert Management Plan (NEMO Plan).	Staff dispensed with this sentence from the alternatives analysis: "Compliance of this alternative with the NEMO Plan would be required." Other than the possible requirement to coordinate with BLM and file Standard Form SF-299, no compliance issue is identified by staff. No further analysis is required because no impact on land use would occur. See the additional text discussion of the applicability of the NEMO Plan under the subsection of staff's alternatives analysis, "Northern and Eastern Mojave Desert Management Plan."
13.43	**p. 28, #30**	Refers to the comparison of impacts on traffic and transportation between the proposed project and the Sandy Valley Off-site Alternative. Describes what would be a more difficult project construction access route to the off-site alternative site, and implies that the impact would not be similar to HHSEGS.	Staff agrees that access to the proposed project site is along a fairly straight, flat roadway from state route 160. However, the “fairly straight, flat roadway” being referred to, the Old Spanish Trail Highway (aka "Tecopa Road"), is not designed to withstand frequent and heavy construction traffic. The addition of 4,000 daily trips would have a significant impact on the structural integrity of the Old Spanish Trail Highway due to the current and potential future conditions of the roadway pavement. Similarly, potential transportation route(s) for the Sandy Valley Off-site Alternative are probably not designed to withstand frequent and heavy construction traffic. Conditions of certification that are similar to those identified for the proposed project in the **TRAFFIC AND TRANSPORTATION** section of the final staff assessment would be required for the Sandy Valley Off-site Alternative to reduce impacts on the roadway infrastructure.
13.44	**p. 28, #31**	Same comment as 13.43.	See response to comment 13.43, above.

13.45	**p. 28, #32**	Refers to the Solar Power Tower (SPT) with Energy Storage Alternative. Questions if it is properly considered an alternative to the project as a whole, or an alternative to a part of the project.	The SPT with Energy Storage Alternative is an alternative to the proposed project. The Applicant's AFC includes a Central Tower with Integral Thermal Storage using molten salt as the heat transfer fluid. It is described as an alternative technology. The SPT with Energy Storage Alternative in staff's alternatives analysis is appropriately reviewed as an alternative to the proposed project. Changing the technology to include energy storage is not an ancillary facet of the proposed project.
13.46	**p. 28, #33**	Refers to staff's analysis of the SPT with Energy Storage Alternative for impacts on avian species related to solar flux. Asks what the basis is for the assertion that impact on avian species are significant. Proposes edits to staff's analysis for impacts on avian species under this alternative to remove text stating that the Applicant has identified no means of mitigating or minimizing impacts on avian species at the HHSEGS site.	Staff disagrees with the Applicant's statement that documentation submitted by the Applicant demonstrates that no significant impacts on avian species could be caused by the proposed project. Furthermore, the zone of concentrated flux considered to pose a danger to avian species extends over 300 meters around each tower, in the shape of a ring (in top down view). To refer to this as “close proximity” is not accurate. See the **BIOLOGICAL RESOURCES** section of this FSA for more details. No change to staff's analysis is necessary in response to this comment.
13.47	**p. 29, #34**	States that no basis exists for a conclusion that impacts on avian species are significant (referring to the text that was deleted by the Applicant under comment 13.46).	See the revised analysis of impacts on biological resources in staff's alternatives analysis for the SPT with Energy Storage Alternative.
13.48	**p. 29, #35**	Asks if the Desert Sunlight Solar Farm PV Project is single axis or fixed tilt.	The Desert Sunlight Solar Farm PV Project will use all fixed-tilt panels, approximately 9 million panels total.
13.49	**p. 29, #36**	Same comment as 13.48.	See response to comment 13.48, above.

13.5O Prt 1	**p. 29, #37**	States that a PV alternative does not provide flexible generation, which brings into question its suitability for large scale generation.	Each of the four utility-scale PV projects described in staff's alternatives analysis has agreements for the sale of electricity to a California utility company or companies. (California Valley Solar Ranch has a contract with Pacific Gas & Electric Company [PG&E]; Desert Sunlight Solar Farm has contracts with Southern California Edison and PG&E; Topaz Solar Farm Project has a contract with PG&E; and AV Solar Ranch One has a contract with PG&E). These PV projects are approved, under construction, and with agreements in place for the sale of electricity, which indicates their suitability for large-scale generation of renewable energy.
13.5O Prt 2	**p. 30, #37**	Describes the operational characteristics of the proposed project.	Staff acknowledges the applicant's summary of the operational characteristics of the proposed project.

13.5O Prt 3	**p. 30, #37**	States that a generic PV alternative would not obtain site control and use for a 500-MW facility in a reasonable period of time. States that the HHSEGS site is too small to support a PV alternative. Concludes that "to produce the same quantity of power to the grid using single-axis or fixed-tilt PV would require 4,950 acres of land, or 51 percent more land than using Applicant's technology."	Staff obtained information on annual energy generation for the four PV projects described in staff's alternatives analysis. See the subsection, “Solar Photovoltaic (PV) Alternative,” of staff's analysis for the additional data and discussion. The two largest PV projects that will have generating capacities closest to the proposed project each have capacities of 550 MW; land use efficiency for the two projects is slightly below 7.0 acres per MW, which is comparable to the proposed project. The average land use efficiency for the four PV projects is approximately 7.0 acres per MW. See also the new text in the alternatives analysis on the April 2012 DRECP Stakeholder Committee Meeting, which included a review of the updated renewable energy calculator developed by Energy Commission staff. A modified land use efficiency ratio of 7.0 acres per MW was determined to be plausible and reasonable for all central station solar projects, including solar thermal and PV project types. Based on the sample 500-MW PV project described by the applicant in its comment, such a project would require 4,950 acres, which represents a land use efficiency ratio of almost 10.0 acres per MW of electricity.
13.5O Prt 4	**p. 30, #37**	Questions the ability of the Solar PV Alternative to satisfy the project objectives addressing construction and operation of a renewable electrical energy facility leading to sales of competitively priced renewable energy consistent with the procurement obligations of California's utilities.	Staff has modified the discussion on the potential for the PV Alternative to attain the first two project objectives. See the revised text on this alternative under the subsection, “Potential to Attain Project Objectives.” Construction and operation of the Solar PV Alternative would require CPUC's approval of amendments to the power purchase agreements for the proposed project.
13.51	**p. 30, #38**	For the Solar PV Alternative, requests editing of text in staff's alternatives analysis to indicate that it is not known whether PG&E would agree to amend the PPAs to allow the project to continue to be feasible.	Staff's analysis of potential feasibility issues for the Solar PV Alternative is sufficient as written. No change was made to staff's analysis in response to this comment.

13.52	**p. 31, #39**	Disagrees with staff's conclusion that potential impacts on biological resources for the Solar PV Alternative would be "similar to HHSEGS." States that impacts on biological resources would be greater than HHSEGS based on the Applicant's assumption that the PV Alternative would require far more acreage and substantial grading and leveling of the site.	See response to comment 13.50 Prt 3 for a discussion of land use requirements for central station renewable energy projects, including solar thermal and PV project types. Staff's analysis of the potential impacts on biological resources for the Solar PV Alternative states that impacts could be slightly more or less if a change to the project boundary was needed to install PV arrays under this alternative. The environmental compliance documents for the utllity-scale PV projects reviewed by staff discuss site preparation techniques to minimize site grading. See the additional text discussion on site grading and disturbance under the subsection of staff's alternatives analysis, "Overview," for the Solar PV Alternative.
13.53	**p. 31, #40**	For the Solar PV Alternative, states that staff's analysis of potential impacts on biological resources should address the impact of increasing the project boundaries to accommodate a 500-MW PV project.	See responses to comments 13.50 Prt 3 and 13.52, above.
13.54	**p. 31, #41**	Edits staff's alternatives analysis describing the potential impacts of the Solar PV Alternative on groundwater dependent biological resources and avian species. Changes the conclusion for potential impacts on avian species under this alternative to be the "same as" or "greater than HHSEGS." States again that the PV Alternative would require substantial grading and leveling of the site.	Staff has determined that the impact on the groundwater basin under the Solar PV Alternative would be much less than HHSEGS. Therefore, the related effect of groundwater pumping on phreatophytic vegetation in the vicinity of the project site would also be much less than the proposed project. See also response to comment 13.52.

13.55	**p. 32, #42**	For the Solar PV Alternative, states that staff's analysis of potential impacts on cultural resources should address the greater impact on subsurface cultural resources from increasing the site footprint and grading the entire site.	The applicant's statement that construction of the proposed project would leave subsurface archaeological deposits intact is incorrect. Archaeological deposits that could be present on the ground surface and to a depth of about 1.0 foot below the surface would be partially disturbed or destroyed due to repeated traffic of construction equipment such as truck-mounted augers, backhoes, and road graders. Archaeological deposits further below the surface could be disturbed during emplacement of approximately 170,000 heliostat pedestals. The effects of this alternative over the western half of the site, on the floor of the bolson, are comparable to the proposed project; the likelihood of buried archaeological resources being located there are low. The analysis of the visual effects of this alternative compared to the proposed project is accurate and appropriate given staff's knowledge and expertise on the topic. See staff's responses to comments in the **CULTURAL RESOURCES** analysis, comments 13.1, 13.1 (1), 13.7, 13.52, and 13.59. See also responses to comments 13.50 Prt 3 and 13.52, above.
13.56	**p. 32, #43**	For the Solar PV Alternative, states that staff's analysis of potential impacts related to geological and paleontological resources should address the greater impacts on those resources from increasing the site footprint and grading the entire site. Also disagrees with staff's analysis and states that the heliostats associated with the proposed project would require no foundations.	The heliostats would be supported by a foundational element referred to by the applicant as pedestals. These pedestals would be inserted to a depth of at least 10 feet below the ground surface to support the weight and wind loading of the heliostats. See also responses to comments 13.50 Prt 3 and 13.52, above.

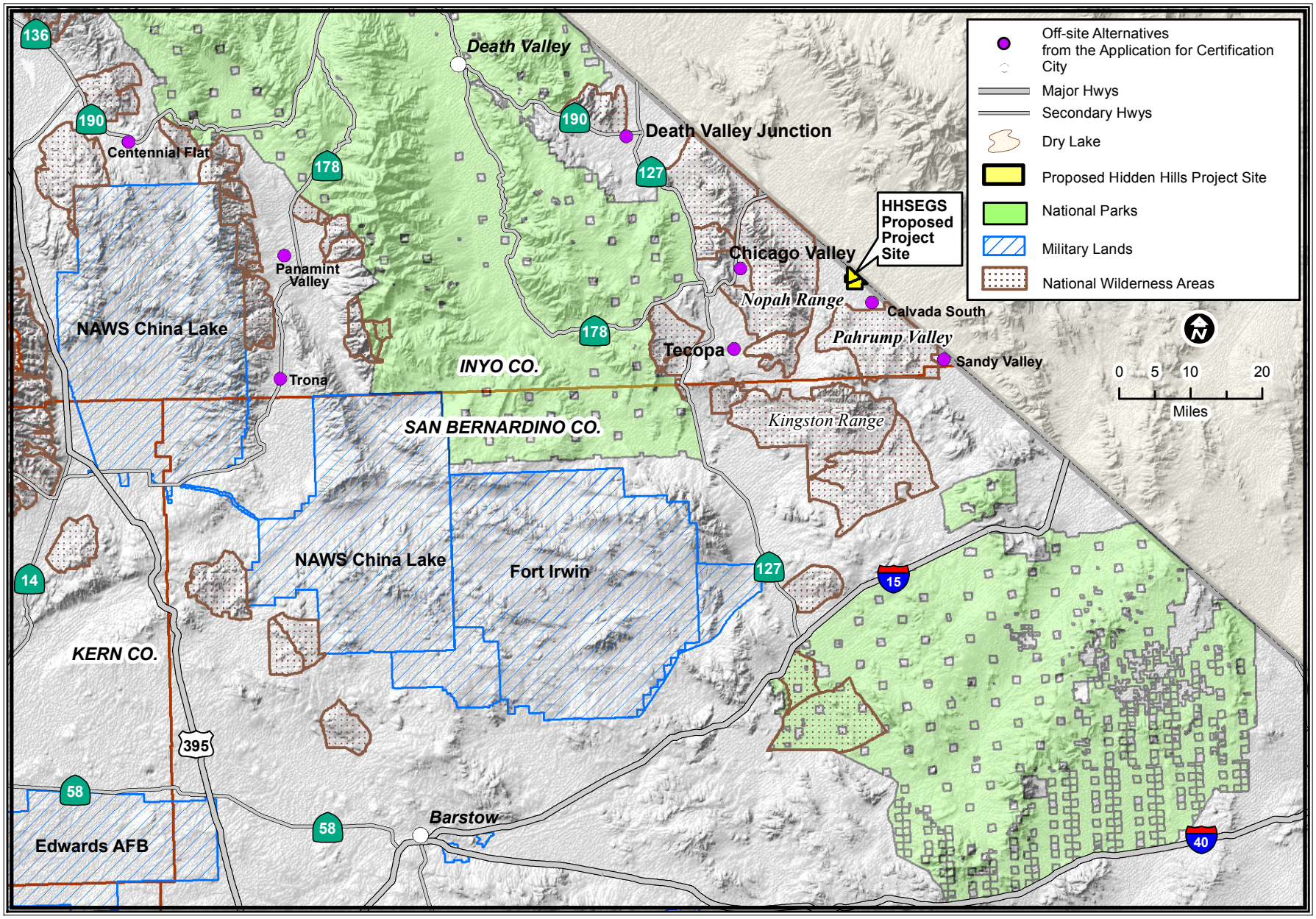
13.57	**p. 32, #44**	For the Solar PV Alternative, states that staff's analysis of potential impacts related to noise would be the "same as HHSEGS" rather than "much less than HHSEGS." The Applicant states that if the noise impacts of the proposed project are reduced to less than significant with implementation of conditions of certification, the impact conclusion should be the same for the PV Alternative.	A PV alternative with the same generating capacity (500 MW) would likely create less noise impacts than HHSEGS, prior to employing mitigation measures. However, with implementation of the conditions of certification (mitigation measures) for impacts related to noise, both the proposed project and the Solar PV Alternative would create less than significant impacts.
13.58	**p. 32, #45**	For the Solar PV Alternative, asks for an explanation of staff's statement that the infrequent washings of PV panels would result in reduced toxic air emissions compared to the proposed project.	See the additional text discussion on the potential use of diesel-fueled water trucks for infrequent washings of PV panels under the subsection of staff's alternatives analysis, "Public Health," for the Solar PV Alternative.
13.59	**p. 33, #46**	For the Solar PV Alternative, disagrees with staff's conclusion that the beneficial impact related to construction employment and increased taxes and fees would be the "same as HHSEGS." The Applicant states that the beneficial impact would be "less than HHSEGS" under this alternative.	See staff's revised conclusion under "Socioeconomic Resources" for the Solar PV Alternative in staff's alternatives analysis. Staff concludes that the beneficial impact related to construction employment and increased taxes and fees would be similar to HHSEGS. Given the similar size and scale of this alternative compared to the proposed project (an approximately 500 MW renewable energy project), staff has determined that the socioeconomic benefits would be similar.
13.60	**p. 33. #47**	For the Solar PV Alternative, states that the impacts of glint and glare, if any, can be mitigated to less than significant for the proposed project and the PV Alternative.	The Solar PV Alternative would have a much lower profile overall, and impacts of glint and glare would be reduced to less than significant.

13.61	**p. 33, #48**	For the Solar PV Alternative, states that impacts on visual resources would be greater than HHSEGS based on the Applicant's assumption that a 500-MW PV Alternative would require far more acreage. States that the Applicant disagrees with the conclusions that impacts on visual resources under the proposed project are significant.	See responses to comments 13.50 Prt 3 and 13.52, above. See also responses to comments in the **VISUAL RESOURCES** analysis.
13.62	**p. 33, #49**	For the Solar PV Alternative, refers to staff's statement in the alternatives analysis that land requirements for utility-scale PV power plants have been stated in the range of about 9.0 acres per MW. The Applicant states that this ratio should be recognized in other sections of staff's alternatives analysis.	See response to comment 13.50 Prt 3 for a discussion of land use requirements for central station renewable energy projects, including solar thermal and PV project types. See the additional text discussion on the estimated acreage requirements for utility-scale PV projects under the subsection of staff's alternatives analysis, "Overview," for the Solar PV Alternative.
13.63	**p. 33, #50**	For the Solar PV Alternative, refers to staff's analysis of impacts related to soil disturbance. The Applicant disagrees with staff's conclusion that the PV Alternative would result in less soil disturbance for construction laydown and temporaray parking impacts. States that the California Valley Solar Ranch Project required a total of 37, 1.0-acre construction laydown areas.	Staff acknowledges that PV facilities require laydown areas and temporary parking for construction activities, which are similar to HHSEGS. However, the proposed project requires the added construction activities of building two power blocks, which includes operating a temporary concrete batch plant and on-site assembly of heliostats, which includes an assembly building and its associated activities. Additionally, staff has found that the PV Alternative could require an average of about 12 percent more land per MW of capacity compared to the proposed HHSEGS project. Based on this estimate, staff concludes that erosion during construction for the PV Alternative is “somewhat greater than HHSEGS.”

13.64	**p. 33, #51**	For the Parabolic Trough Alternative, questions staff's conclusion for the potential for avian species to collide with project structures (i.e., the solar power tower under the proposed project) to be "much less" for the Parabolic Trough Alternative. The Applicant asks "much less than what?"	See the revised analysis of impacts on biological resources in staff's alternatives analysis for the Parabolic Trough Alternative. Staff acknowledges the degree of uncertainty in predicting or estimating the likelihood of impacts on avian species from collisions with project structures.
13.65	**p. 34, #52**	For the Parabolic Trough Alternative, states that the "low-impact design of the HHSEGS" would "reduce ground disturbance" and result in less impacts on cultural resources.	Staff confirms that increased ground disturbance under this alternative would have a somewhat greater potential to disturb or destroy archaeological deposits compared to the proposed project. See the revised text on the effects of the Parabolic Trough Alternative under the subsection, “Cultural Resources,” in staff's alternatives analysis. However, the net effect—the profound reduction of this alternative's visual effects would result in a much lower overall effect on cultural resources compared to the proposed project.
13.66	**p. 34, #53**	States that the No-Project Alternative would result in residential development of up to 170 parcels on the project site, and that compared to the proposed project, the HHSEGS project would be environmentally superior.	See responses to comments 13.22 and 13.30, above.

ALTERNATIVES - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Off-site Alternatives Evaluated in the Application for Certification



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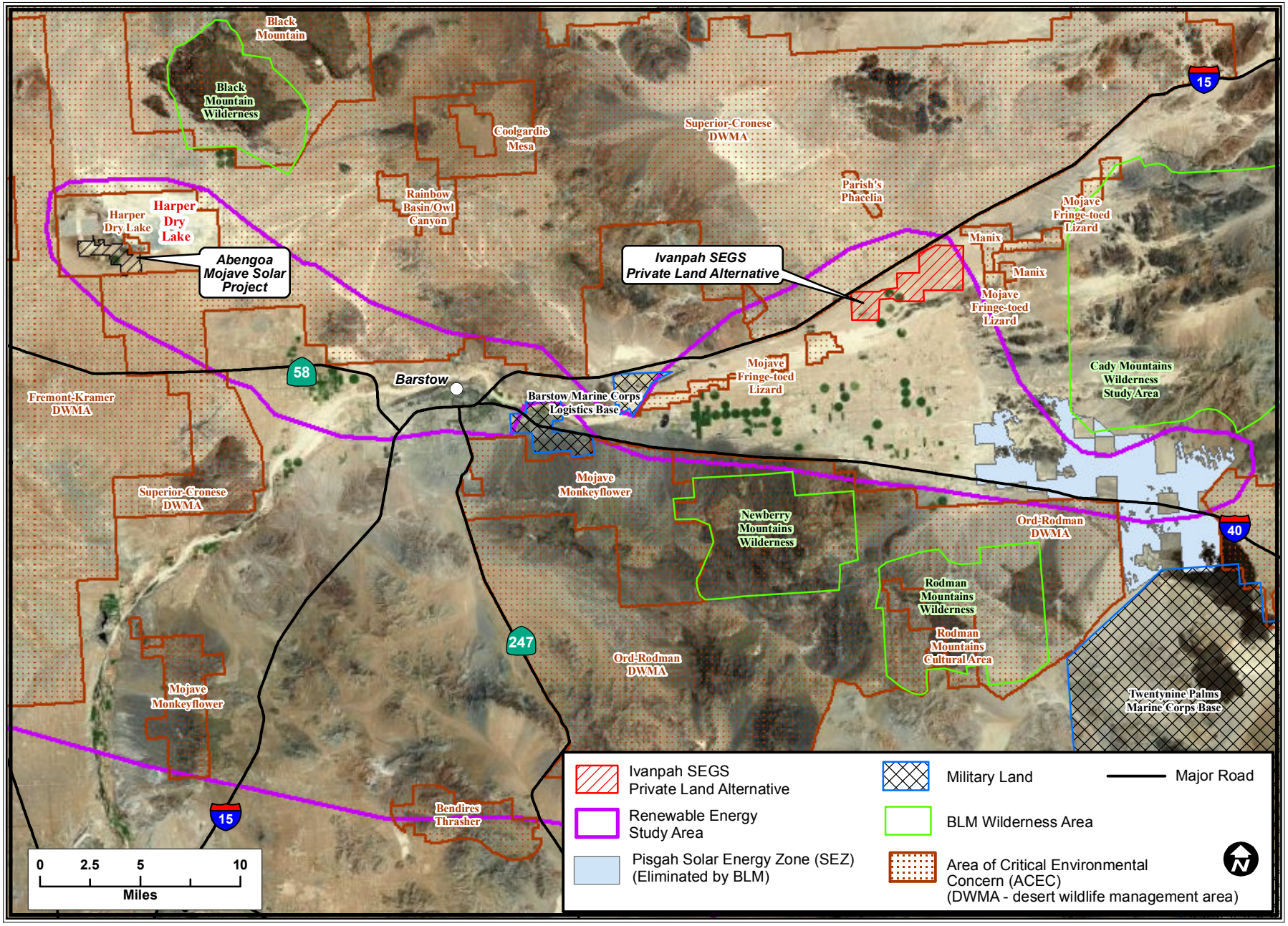
SOURCE: Adapted from Hidden Hills Solar I, LLC; Hidden Hills Solar II, LLC 2011a

ALTERNATIVES - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Barstow Renewable Energy Study Area



ALTERNATIVES

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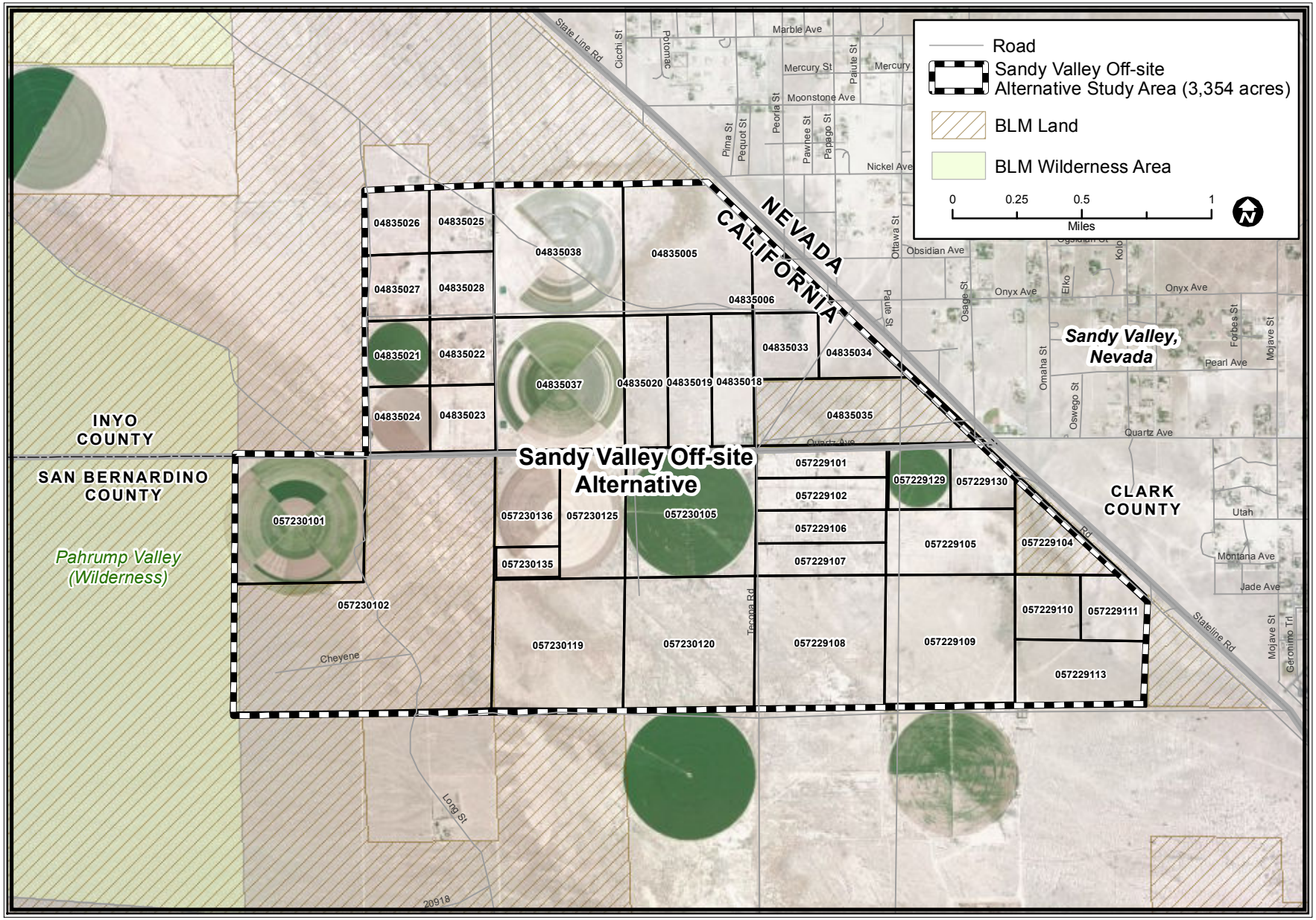
SOURCE: California Energy Commission - Tele Atlas Data - BLM - Bing Aerial Image; Energy Commission 2011a

ALTERNATIVES - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Sandy Valley Off-site Alternative Study Area



ALTERNATIVES

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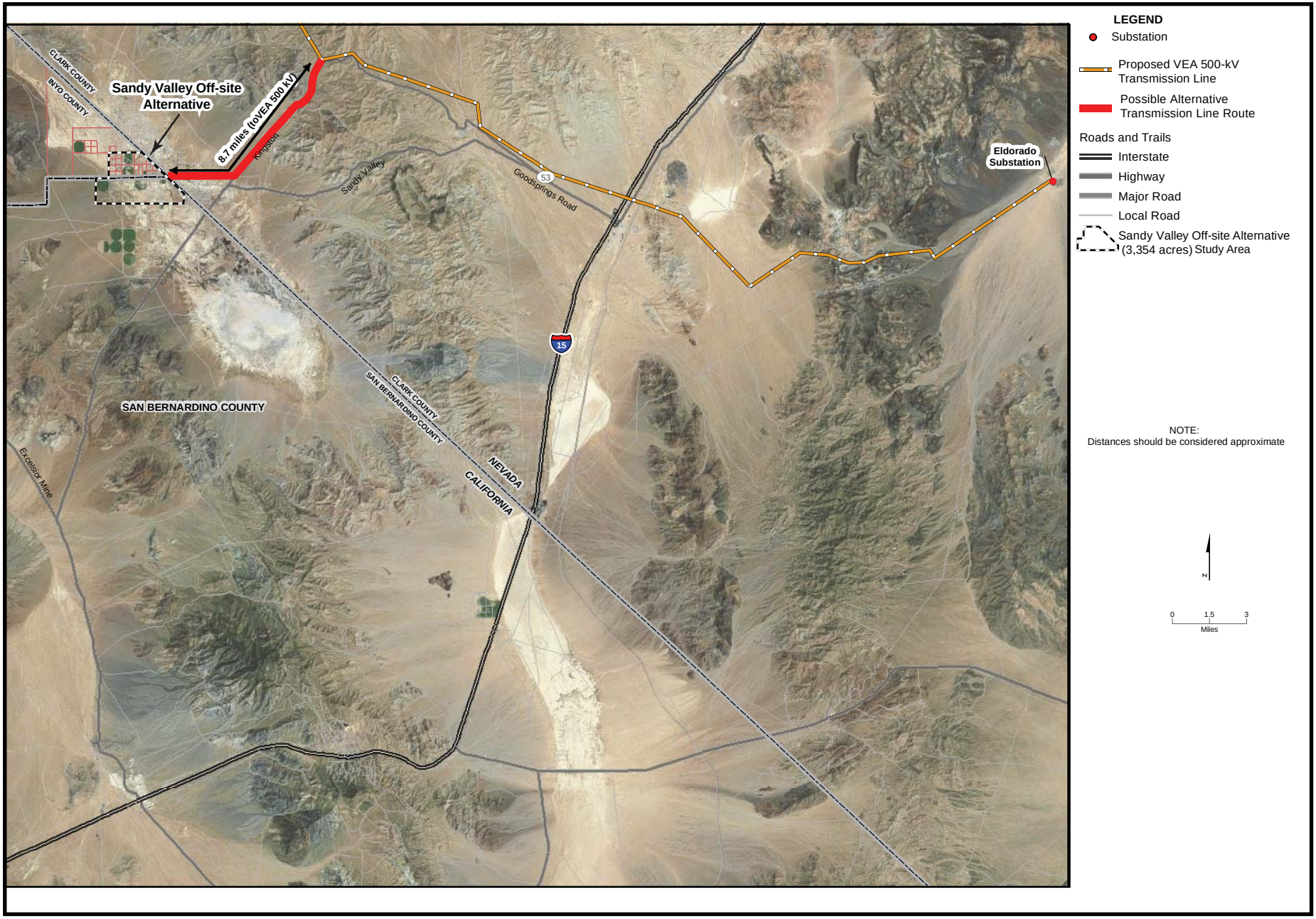
SOURCE: Energy Commission Staff

ALTERNATIVES - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Potential Transmission Line Alignment for the Sandy Valley Off-site Alternative



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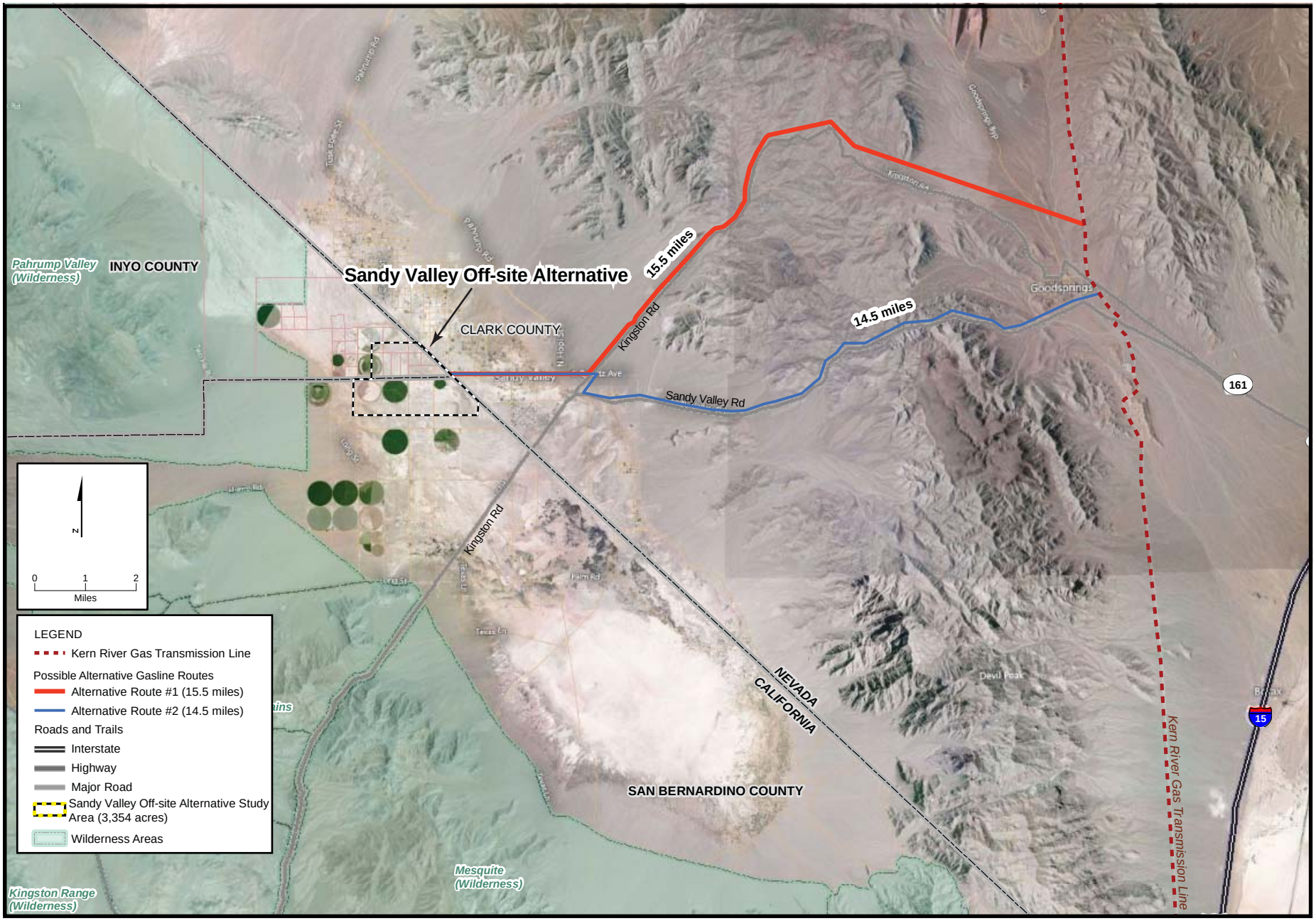
SOURCE: Adapted from Hidden Hills Solar I, LLC; Hidden Hills Solar II, LLC 2012b

ALTERNATIVES - FIGURE 5

Hidden Hills Solar Electric Generating System (HHSEGS) - Potential Natural Gas Pipeline Alignments for the Sandy Valley Off-site Alternative



ALTERNATIVES

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SOURCE: Adapted from Hidden Hills Solar I, LLC; Hidden Hills Solar II, LLC 2012b

ALTERNATIVES - FIGURE 6a, 6b

Hidden Hills Solar Electric Generating System (HHSEGS) - Photographs of the Sandy Valley Off-site Alternative Study Area

View toward the Sandy Valley study area from Sandy Valley, NV

View of the Sandy Valley study area looking toward the Pahrump Valley Wilderness and Kingston Range

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SOURCE: Energy Commission Staff

ALTERNATIVES - FIGURE 6c

Hidden Hills Solar Electric Generating System (HHSEGS) - Photographs of the Sandy Valley Off-site Alternative Study Area

View from the Sandy Valley study area toward Sandy Valley, NV

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SOURCE: Energy Commission Staff

ALTERNATIVES - FIGURE 7

Hidden Hills Solar Electric Generating System (HHSEGS) - Solar Power Tower with Energy Storage Alternative

Solar Power Tower with Molten-Salt Energy Storage

Source: BrightSource Energy

Completed 540-foot Solar Power Tower for the Crescent Dunes Solar Energy Project in Tonopah, NV

Source: SolarReserve

Copper Mountain Solar 1 in Boulder City, NV, about 40 miles southeast of Las Vegas

Source: Discovery News

First Solar's Thin Film Solar Photovoltaic Field

Source: Susan Lee

ALTERNATIVES - FIGURE 8c

Hidden Hills Solar Electric Generating System (HHSEGS) - Solar Photovoltaic Alternative

Horizontal Single-Axis Trackers (Ray Tracker) Solar Installation near Winters, California

Source: Wikipedia

ALTERNATIVES - FIGURE 9a

Hidden Hills Solar Electric Generating System (HHSEGS) - Parabolic Trough Alternative

Parabolic troughs like those orginally proposed to be used at the Blythe Solar Power Project in California

Source: Energy Commission

ALTERNATIVES - FIGURE 9b, 9c

Hidden Hills Solar Electric Generating System (HHSEGS) - Parabolic Trough Alternative

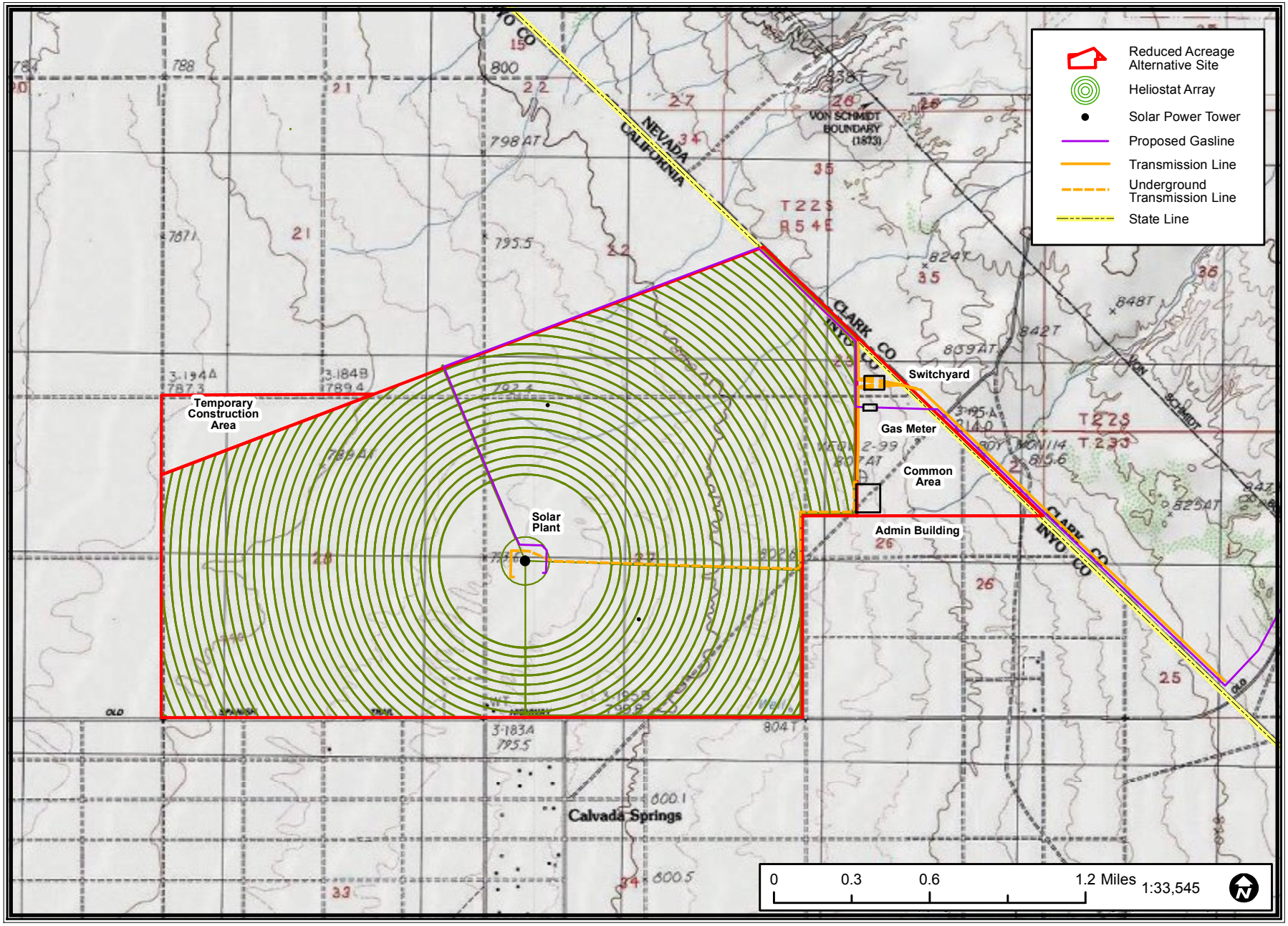
Two views of the Solar Electric Generating Systems Projects at Kramer Junction

SOURCE: Michael Clayton & Associates

SOURCE: Michael Clayton & Associates

ALTERNATIVES - FIGURE 10

Hidden Hills Solar Electric Generating System (HHSEGS) - Reduced Acreage Alternative



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SOURCE: Adapted from Figure 2.1-2, CH2MHILL, USGS Topographic